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VETERINARY MEDICINE

OCTOBER 1944

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In 1912, the average hospital stay for an appendectomy was 18 days, now it is 11 days. The case fatality of epidemic meningitis in 1910 was 80%, in 1935, 30%. It is now 5%.

Midsummer sunlight has a six-fold advantage over midwinter sunlight in concentration of ultraviolet rays having effects on human health, as measured by the National Bureau of Standards.—*Sci.*

It is estimated that to meet the 1944 goal of 121 billion pounds of milk, 23,300,000 cows will produce an average 4639 pounds each and that to feed them will require more than 18 million tons of grain mixture.

In an experiment which included feeding 640 turkeys from hatching to market age—28 weeks—the Bureau of Animal Industry determined that the birds had developed as rapidly and made as good gains on rations containing only vegetable proteins as on rations deriving their protein in part from dried skim milk, meat scrap and fish meal. The turkeys cost less per pound to produce on the all-vegetable protein ration.

In World War I, crop and livestock production rose 5% over the average of the preceding five years. The corresponding increase in this war has been 25%. The increase in the number of milk cows has been 8%; of other cattle 25%. The 1943 pig crop numbered 122 million, 66% above the 10 year average. Recent reports indicate poultry is 34% above the average and the number of eggs per layer 10% higher. The numbers of horses and sheep are below the average of the past 10 years.

Believe it or not—*The National Humane Review* recently featured an illustration of a gory bullfight!

Beef cattle in this country now number 17 million more than in 1938 and the trend is still upward. For two years the U. S. Department of Agriculture has been urging increased marketing of beef cattle, but without noticeable effect. With the cessation of the wartime demand for beef, the cattle industry seems to be in for some difficulties.

In a study of single and multiple bull breeding units at the U. S. Range Live Stock Experiment Station in Montana it was found that the average number of cows in single bull herds was 28 and the average number of cows per bull in herds having two or more bulls was 19. Notwithstanding the higher ratio of cows per bull in the small herds their breeding record was 6% better than that of the larger herds.

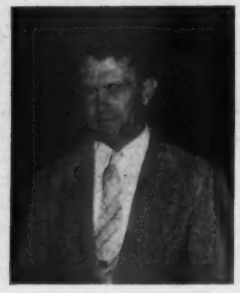
Foods most likely to be responsible for food-poisoning outbreaks are moist, bland ones, such as cream-filled pastries, spaghetti, macaroni, turkey or chicken stuffing, gravies and creamed dishes of various sorts. Certain types of salads, ham which has undergone a tendering process and, occasionally, corned beef also may give trouble. Germs that cause food poisoning grow well in such foods unless kept at very hot or very cold temperatures.

Foods which are dry, highly acid, highly spiced or with high concentrations of salt are likely to be free from the food-poisoning menace since such foods do not support bacterial growth—*Sci.N.L.*

1944 A. V. M. A. Convention

The 81st annual meeting of the American Veterinary Medical Association held in Chicago, August 22, 23 and 24, 1944, was surprisingly well attended and highly successful. The official registration, subject to modification in checking, contained the names of 1530 members, exhibitors and visitors of whom 132 are in the military service. As usual a number neglected to register; more than usual, it seemed. The total attendance probably approached 1700. The attendance at last year's "Wartime Conference" was approximately 700.

The plan of dispensing with sectional meetings and holding only general sessions proved highly advantageous. Practically all sessions were well attended and on only two occasions, and for but short periods, was the meeting hall uncomfortably crowded. The many reels



B. T. SIMMS
President-elect of the A.V.M.A.

of motion pictures shown were both interesting and informative and were much appreciated by the audiences.

Dr. B. T. Simms, Director of the Regional Animal Disease Research Laboratory, Auburn, Ala., was chosen president-elect. Drs. W. A. Barnette, Greenwood, S. C., C. R. Donham, Lafayette, Ind., M. O. Barnes, Olympia, Wash., F. H. Suits, Odessa, Mo., and J. A. Campbell, Toronto, Ont., were elected vice-presidents. Dr. J. V. Lacroix, Evanston, Ill., treasurer. President-elect James Farquharson, Colorado State College, Ft. Collins, was installed president. Dr. W. A. Hagan, dean of New York State Veterinary College, was elected chairman of the executive board.

The XII International Veterinary Congress Prize was awarded to Dr. David Franklin Luckey, St. Louis, Mo., for his leadership in demonstrating the efficiency of the intradermal tuberculin test and in bringing about its adoption by the states and eventually by the federal Bureau of Animal Industry. Doctor Luckey, then state veterinarian of Missouri, began the use of this test in 1908 and made it official in Missouri in 1911. From that time it was adopted rapidly by other states for official testing and, finally, in 1921, it was accepted by the B.A.I. for official use in the bovine tuberculosis eradication project, then four years old. Tuberculosis of cattle in this country could not have been brought under control by use of the thermal tuberculin test, with the number of veterinarians available or appropriations likely to have been made. It is not an overstatement to say that the intradermal test introduced by Doctor Luckey made possible the notable achievments that have been made in bovine tuberculosis eradication.

The Borden award went to Dr. I. Forrest Huddleston, Michigan State College, East Lansing, Michigan, for his work on brucellosis. Doctor Huddleston was the recipient of the XII International Veterinary Congress prize in 1940 for his work on that disease.

The A.V.M.A. Humane Award was given to Frank Kiemele of Chicago for his promotion of a humane attitude toward animals on the part of children.

Committee Reports

Committee recommendations included:

1. That veterinarians make an intensive study of tropical diseases of animals, that they may be better prepared to cope with them, if they should be introduced by returning ships, planes or animals after the war. A permanent committee to consider post-war problems was also recommended.

2. That a national board of veterinary examiners similar to the national boards of medical and dental examiners be established. The purpose being to grant certificates which would enable the holder to register in any state, without an examination, in which he wishes to practice. The committee asked that state veterinary associations study the proposition during the coming year.

3. That a veterinary vital statistical service be established to compile and publish information on the prevalence of animal diseases and the losses sustained from each important ailment of animals.

4. That the various states inaugurate a state system of meat inspection for slaughtering not inspected by the federal government. It was estimated that the 1944 meat production in this country will aggregate 25 billion pounds, on a dressed weight basis, and will include 100 million swine and 17 million cattle. It is predicted that 74% of the pork, 72% of the beef and 51% of the veal will be inspected. The need for the inspection of poultry meat was stressed. Frozen locker plants now handle

nearly a billion pounds of meat a year, nearly all of it uninspected. A great increase in the number of such plants is expected, after the war.

5. That greater emphasis be placed on preventive medicine and livestock sanitation in the training of veterinarians. "Four colts must be born to raise two work horses, three pigs must be farrowed to bring two to maturity and four layers must be raised to get eggs from three." A division of animal vital statistics should be set up to give a true picture of the scope of diseases in different sections.

6. That better care be given the nation's horses and mules in keeping with their increased value; that more research into the nutritional needs of the soliped, into parasite control and disease eradication in these animals and into a disease in mules that is causing heavy losses after they are shipped long distances, be undertaken.

7. That dairy herds be culled and the animals that are retained be given an adequate ration. That the long hair on udders of dairy cows be clipped at monthly intervals and the udders wiped with cloths moistened with chlorine solution before each milking. In a test, clean cows with healthy udders gave milk which had a bacterial count of 20,000. Clipping the long hair from the udder reduced the count to 6,000 and wiping the udders with cloths moistened with chlorine solution brought a further reduction to 550.

8. That the rotation of sheep pastures be practiced as a means of parasite control; sheep pastures being grazed by other species during alternate years. Sheep grazing on western ranges is threatened by increasing restrictions on grazing on government owned lands and by deterioration of the ranges. Steady progress is being made in the control of sheep parasites.

9. That all veterinarians be on the alert to detect new diseases and parasitisms that may be imported with pets and mascots brought home by soldiers from overseas. Despite all vigilance on the part of sanitary officials, practitioners may be called upon to diagnose and treat parasitic diseases which are new to them. Livestock parasites are costing farmers more than 200 million dollars a year now, in lowered production, and there is danger of the introduction of new types of livestock parasites to further complicate the problem of maintaining animal health.

10. That anti-rabies vaccination be employed in connection with other measures to control the widespread outbreaks of rabies which have occurred in many parts of the country.

Other committees made no recommendations but reported:

1. That America's No. 1 project in meeting increased war demands for dairy, beef and pork production, is the control of brucellosis. Approximately 425,000 animals are given the agglutination test for this disease per month. Considerable success has been experienced in

JAMES FARQUHARSON
President of the A.V.M.A.

the use of calf vaccination, which accompanied by elimination of reactor animals, has been responsible for the greatest amount of progress in the control of the disease. Swine brucellosis is "one of the most important diseases of animals transmissible to man."

2. A 3% reduction in adult poultry losses in this country, as a result of a drive to conserve flocks for wartime meat and egg production, was reported.

"For the first time in more than a decade, the rate of adult mortality in the nation's poultry flocks was turned back from 19.6% to 16.2%—this in the face of the most serious obstacles ever encountered by the industry, including over-burdened transportation, labor shortages, and feed scarcities."

Continued progress in the nation's fight against pullorum disease was also reported. The report showed that whereas 2,640,000 birds were tested for this disease in 1933-34, there were 18,457,000 tested in 1942-43. The percentage of reactors dropped, in that 10-year period, from 3.77% to 2.40%.

"Some increase in deficiency diseases has

been noted, chiefly as a result of the lack of Vitamins A, D. and riboflavin."

3. The U. S. Department of Interior is maintaining a reservoir of dangerous livestock diseases in our national parks and game preserves,* while the Department of Agriculture

I. FOREST HUDDLESTON

is spending huge sums to stamp out these same diseases among domestic animals, according to the committee on diseases of wild animals and it urged an intensification of research on disease of wild animals.

4. Artificial insemination in dairy cows is becoming increasingly popular; nearly 100,000 cows having been bred in this manner in three states—New Jersey, New York and Wisconsin—last year.

5. Fifteen diseases which are definite threats to adequate swine production in this country were listed by the committee on swine diseases as: hog cholera, enteritis, dysentery, salmonellosis, erysipelas, influenza, brucellosis, pox, icteroanemia, rhinitis, nervous diseases, parasitic diseases, baby pig disease, anemia and photosensitization.

Livestock sale barns, and public stockyards where large numbers of animals mingle, were designated as important potential spreaders of swine diseases.

"Such important diseases of feeder hogs as dysentery probably will not be satisfactorily controlled until the traffic in diseased and exposed hogs is stopped. The farmer should be warned regarding purchasing hogs from uncertain or infected sources. Newly-acquired animals should be held in quarantine for two or three weeks, before being placed with healthy hogs. Livestock sanitary officials should also make certain that hogs in transit are hauled in cleaned and disinfected vehicles."

The possibility of the war resulting in new foreign diseases being introduced in this country was pointed out.

"Ships plying between our country and foreign countries are now touching ports not used during peace times. The danger of introducing foreign animal diseases is greatly increased. Constant vigilance on the part of veterinarians is needed to protect the swine industry from foreign diseases, in addition to the ones already here."

Papers Presented

E. C. Auchter, U. S. Department of Agriculture, in an address, which he sent to the convention, listed nine veterinary achievements as key measures in helping to make possible the nation's tremendous food production during the present war. They are: (1) Stamping out foot-and-mouth disease of cattle; (2) eradicating sheep scab from western ranges; (3) eliminating cattle tick fever; (4) development of preventive hog-cholera serum; (5) reduction of bovine tuberculosis; (6) control of cattle brucellosis; (7) control of pullorum disease of poultry; (8) preventive vaccination against horse sleeping sickness; (9) discovery and use of phenothiazine for controlling internal parasites of livestock.

"Ten million dollars a year is a conservative estimate of the savings in livestock losses through the use of phenothiazine," Doctor Auchter declared. "The cost of this veterinary discovery was about $10,000, including the part-time salaries of three scientists over a period of five years.

"We have more milk and meat (and fewer tuberculous children) as a result of the successful campaign the veterinary profession has waged to eradicate cattle tuberculosis. Instead of having one tuberculous beef animal in 20, as was the case in 1917 when the campaign started, we now have one in 300.

"Besides lifting the curse of tick fever from the cattle industry, this veterinary research showed how tick fever is transmitted and opened the way for the ultimate control of many insect-borne and tick-borne diseases of human beings.

"The campaign against cattle brucellosis affects public health, as well as agricultural production, since the Brucella organism may produce undulant fever in human beings. Likewise the discovery of a successful vaccine for equine encephalomyelitis has been beneficial to mankind, since the virus of this horse

*The Department of the Interior issued an official statement, after the report of the Committee on Wild Animals was released, categorically denying the above and other charges of the committee concerning the spread of diseases and parasitisms by wild animals.

disease may produce human sleeping sickness as well."

Doctor Auchter also pointed to the fact that American veterinary scientists may contribute an important post-war service by helping such international developments as that of the newly-projected Food and Agriculture Organization of the United Nations. He said that one of the important tasks of this worldwide organization will be to assist nations in raising nutritional standards which, among other things, will mean rebuilding or establishing livestock herds and making full use of veterinary science to maintain food production.

Ralph R. Reese, New Jersey Agricultural Experiment Station, reported on the striking effect of the administration of stilbestrol and hormones on reproduction and on milk production.

A 33-month-old Jersey heifer which had never had a calf produced 8,046 pounds of milk and 383 pounds of butterfat in 305 days, after being given injections of stilbestrol dipropionate. A Holstein Friesian heifer that had failed to conceive after four attempts at breeding produced 6,634 pounds of milk after she was given hormone injections.

The fertility of three bulls was restored by hormonal therapy, through the injection of 1,000 rat-units of chorionic gonadotrophin.

The author stated that veterinary research workers are still in the exploratory stage of their work with hormones. There is still much to be learned about the many ramifications of the subject.

"As an animal approaches sexual maturity the anterior lobe of the pituitary gland secretes increasing amounts of hormone, and this induces growth of the ovarian follicle and stimulates spermatogenesis." An experience was cited with 189 cows with ovarian inactivity, which were injected with estrogen; 85% of these cows came into estrus. In this same group of cows there were 81 which were bred and subsequently checked for pregnancy. Sixty, or 74% had conceived.

In a paper sent to the meeting by J. A. Barger, Inspector in Charge, U. S. Bureau of Animal Industry, Des Moines, Ia., the loss of livestock due to disease was estimated at 400 million dollars annually.

"At some slaughtering centers, as high as 18% of the hogs were retained last year because of swine tuberculosis of avian origin. The average is about 10%. The tremendous loss can be realized when we recall that 4,030,207 hogs were retained because of tuberculosis at federally-inspected slaughtering houses in 1943.

"In areas of swine erysipelas infection, approximately 4% of non-vaccinated swine die from erysipelas, and about 7% become crippled. The vaccination of 1,364,000 swine by veterinarians in one year therefore meant the saving of 13,640,000 pounds of pork which would have otherwise been destroyed by this disease.

"About 30% of the cattle hides sold in the United States from December to April are damaged by cattle grubs to the extent that they have to be degraded. In addition, beef trimmed from carcasses so affected last year amounted to more than 10,000,000 pounds. A vigorous campaign against these parasites will mean more beef, more hides, more shoe leather.

"Careless and improper handling of live-

MADAME MARIE JULIE COLBJORNSEN

Mme. Colbjornsen, daughter of a veterinarian and wife of the financial counselor to the Norwegian Embassy in Washington, addressed the Women's Auxiliary of the A.V.M.A. at its annual luncheon and was a speaker at the Avmatax. She broadcast over WGN during the meeting on: "My Escape from the Nazis." Mme. Colbjornsen lived in occupied territory for a year

stock in shipment results in losses ranging from the animals being killed outright, to those which are bruised and damaged. This alone causes an estimated loss of 75,440,000 pounds of meat annually."

To show what can be accomplished by campaigns against specific disease, Doctor Barger

indicated results achieved in the 25-year campaign conducted by veterinarians against cattle tuberculosis. "Nearly four million tuberculous cattle were consigned to slaughter in the task of eradicating this disease. But we obtained splendid results, and the incidence of human tuberculosis has decreased materially. At one time whole hospital wards were devoted to children suffering from tuberculosis, most of which was considered to be of bovine origin—but today this condition no longer exists."

Research, which may help save American farmers hundreds of thousands of dollars annually from losses due to necrotic enteritis, was reported by Robert Graham, E. H. Peterson, C. C. Morrill, H. J. Hardenbrook, G. E. Whitmore and P. D. Beamer, of the Department of Animal Pathology and Hygiene, University of Illinois.

In field tests conducted for the past year, sulfathalidine, one of the newer of the sulfa drugs, has shown encouraging results in the treatment of this disease.

Of 707 pigs affected with enteritis in naturally-occurring outbreaks and treated with sulfathalidine, 628, nearly 90% made satisfactory recoveries. Of 96 similarly affected but untreated pigs, 42, only 44%, recovered satisfactorily. The drug is relatively ineffective in treating pigs where pneumonia has become a prominent part of the disease picture.

The report also indicated that sulfathalidine has definite value in protecting healthy swine from enteritis when the disease is present in the herd. Of 539 normal pigs treated with the drug in herds where clinical enteritis was present, 95.6% remained healthy.

Sulfathalidine appears to be entirely nontoxic to swine in the dosages which are effective in the treatment of enteritis.

Several of the newer sulfa drugs have shown promise in the treatment of swine digestive disorders including infectious enteritis, according to H. C. H. Kernkamp, who presented a paper on gastro-enteric diseases of swine.

"Our most extensive investigation was made with sulfaguanidine, and the results were very favorable. We also tried sulfasuxidine and had favorable results. The results obtained with sulfathalidine also, were very encouraging. The treatment of a herd suffering from infectious enteritis requires sanitation and hygiene. A cement floored enclosure, cleaned and washed daily, helps keep down infection."

Doctor Kernkamp also discussed damage caused by thornheaded worms, roundworms, coccidiosis and balantidiasis.

Dr. W. T. S. Thorp of The Pennsylvania State College, reported success in the treatment of swine enteritis with both sulfathalidine and sulfaguanidine.

"Sulfathalidine showed favorable results also when used clinically on 75 cases of calf scours. Further studies on sulfaguanidine have confirmed its efficiency for calf scours. Sulfaguanidine has proved very useful also in coccidiosis in both poultry and livestock. Observations on the use of sufamerazine for calf pneumonia are also very encouraging.

Doctor Thorp cautioned, however, that each of the sulfa drugs has definite limitations, and that they should be used on farm animals only under veterinary guidance, to ensure proper results.

Absentees

To avoid further overburdening the transportation systems of the country and to conserve facilities for the transportation of military personnel and supplies, veterinarians in the United States Department of Agriculture, Department of the Interior and in other civil service positions did not attend the meeting. They were missed greatly. This was particularly true of the large contingent from the Bureau of Animal Industry in Washington which under normal conditions adds much to our meetings. However, their patriotic motives in refraining from travel at this time was applauded by everyone and the president-elect was chosen from this absent group.

A.A.H.A. Meeting

Following its custom of former years the American Animal Hospital Association held a meeting in connection with the A.V.M.A. meeting, this time on Friday following the latter. A full day's program was presented.

Practitioners' Association

Secretary Flynn of the Veterinary Practitioners' Association announced that no meeting of that association will be held this year in deference to the request of the government that all civilian travel not absolutely necessary be avoided to conserve transportation facilities for the war effort. The meeting last year also was abandoned for this reason. In the meantime the members of the association are staying on the job and aiding the food production program in every way possible. Doctor Flynn, who had retired, is back at work managing three veterinary hospitals for veterinarians who are now in the Armed Forces.

By correspondence, officials of the association are endeavoring to have a veterinarian attached to the staff of each U. S. Embassy.

Establishment of a Registry of Veterinary Pathology at the Army Institute of Pathology

RECENTLY the Surgeon General of the U. S. Army established a Registry of Veterinary Pathology at the Army Institute of Pathology, Army Medical Museum, Washington, D. C. This registry will become a unit of the American Registry of Pathology, an organization operating by the authority of the Surgeon General under the sponsorship of the National Research Council.

The purpose of the American Registry of Pathology is comprehensive investigation in certain special fields. Through close cooperation with various national societies, records and material in these special fields are brought together at the Army Institute of Pathology for systematic study. The number of specimens received is considerable; for example, there are now available for investigation 4,747 tumors of the urinary bladder and nearly 2,000 malignant melanomas of human eyes. There are also on hand prepared sections of eyes from many diffierent species of animals. All the material and the records of the Registry are available for study to graduate students, specialists, as well as other authorized persons.

William H. Feldman

For Registry of Veterinary Pathology it is desired to assemble (a) material representing general pathologic anatomy, including vitamin deficiencies, specific diseases of different tissues and organs, and examples of natural and experimentally induced neoplasia; (b) a complete collection of prepared slides representing the normal histology of the different species of animals, including domesticated and wild mammals, birds, and cold-blooded vertebrates, and (c) material illustrating experimentally induced lesions of infectious diseases.

As material accumulates, loan sets of slides will be made available for study. Similarly, sets of lantern slides will be prepared which pertain to topics of special importance; these also will be available for loan to contributors.

This announcement is for the information of veterinarians and others interested in comparative pathology; it is hoped that they will make full use of the Registry and send to it material deemed of interest for teaching and for the investigation of animal and human diseases. Material submitted should be addressed to: The Director, Army Institute of Pathology, Army Medical Museum (attention: Registry of Veterinary Pathology), 7th and Independence Avenue, S.W., Washington 25, D. C. The director will be glad to furnish further instructions to contributors for submission of material to the Registry of Veterinary Pathology.

The special committee on registry of veterinary pathology comprises W. H. Feldman, Mayo Foundation, Chairman, Captain Charles L. Davis, V.C., Army Institute of Pathology, Harry W. Schoening, Chief, Pathological Division, U. S. Bureau of Animal Industry and member *ex officio* Lt. Col. Balduin Lucké, M.C., Deputy Director, Army Institute of Pathology.

* * * *

In experiments performed on dogs dicumarol (the anticoagulant principal in sweet clover hay) when given orally (5mg) delayed the coagulation of the blood from six minutes (normal) to 20 minutes. The delayed clotting persisted for several days. No injurious effects of the dicumarol were noted. The administration of dicumarol may simplify direct blood transfusion in dogs.

* * * *

Use of Plastics in Transfusion

A special solution of the plastic, polyvinyl alcohol, has proved more than twice as effective as plasma in saving rats from dying of shock in studies reported by Surgeon Lieutenant William Locke, of the Royal Canadian Navy.

When the polyvinyl alcohol solution was given as immediate treatment for shock, 65% of the animals survived. When plasma was used, 25% of the animals survived. Survivals were 40% with salt solution, 25% with isinglass, and 8% in untreated controls.

If methyl cellulose, a plastic, is mixed with blood as it is drawn from the donor, the red blood cells pile up like coins and settle quickly. In 24 hours plasma equivalent to almost half the total blood volume can be siphoned off and used at once safely. The plasma may be stored for a year at room temperature and still be safe to use.

CARY HALL

The newest and finest building of the College of Veterinary Medicine of the Alabama Polytechnic Institute has been officially named Cary Hall in honor of the late Dr. C. A. Cary, first Dean of the school. Charles Allen Cary was born at Millersburg, Ia., in 1861. He was graduated from the Iowa State College in 1885 with the degree of B.S. and from the Veterinary Department of the same institution in 1887. Doctor Cary practiced two years at Keokuk, Ia., taught two years at the South Dakota Agricultural College, spent a year in graduate work at the University of Missouri and nine months in various European schools; then went to Alabama as head of the veterinary department at the A.P.I. and as State Veterinarian, which positions he held for 43 years. He died Apr. 27, 1935 in his 74th year. Doctor Cary's varied professional and official activities are indicated by the following quotation from his obituary in VETERINARY MEDICINE: "Few names have illuminated more chapters of veterinary history and none has occupied the place of commanding importance of the livestock industry of the South that he occupied."

Amateur Wrestling Champion

M. A. Northrup, a San Francisco practitioner, journeyed across the continent in March to compete in the American Athletic Union, National Wrestling Championship in Baltimore and won the national first-place award in the 175-pound class. Last year he won first place in the 165-pound class.

Wrestling is a hobby with Doctor Northrup. He has participated in all Junior and Senior National Tournaments since 1939 and at present holds both the Pacific A.A.U. and the Far Western Championships in addition to the national championship, which he won in March.

Doctor Northrup, who began wrestling while at the Washington State College in 1930, avers that it is the finest of sports. "If one doesn't have a well proportioned body, wrestling will make it so. One can keep at it and improve one's ability almost indefinitely." There are wrestlers who have passed three-score and ten who can give a good account of themselves. Johnny Eareckson participated in his 31st national wrestling tournament this year. "No sport or science can equal wrestling when it comes to increasing one's fitness and fire power in unarmed and disarming combat. In unarmed combat there are only two individuals who can overcome a good wrestler; one is a better wrestler, the other is one's wife."

Wrestling is a favorite sport of the blind and there are many blind wrestlers who are excellent performers. There are also one-armed and one-legged wrestlers who can give a good account of themselves. Doctor Northrup advocates wrestling as a means of rehabilitating handicapped veterans. "Amateur-wrestling is a profound science of leverage, balance and strategy." He quit wrestling for two years when he began practice and speedily became "a physical degenerate"; however the build-up was equally speedy when wrestling was taken up again.

Those who recall Doctor Northrup's article in the April issue of VETERINARY MEDICINE (p. 270) will probably conclude that he employs in his practice some of the strategy he learned in wrestling.

Wool-Blindness in Sheep

When sheep have too much wool on the face, they cannot see to graze well. Experiments in Idaho by the U. S. Department of Agriculture have shown that open face ewes produce approximately 10% more pounds of lamb in a year than wool-blinded or partly wool-blinded ewes.

The wool-blind characteristic appears to be inherited, judging by results from the selection of open-faced sheep for breeding. At weaning time 17% of the lambs of the Department's Rambouillet sheep had open faces as compared with 11% the previous year, while the number of lambs having wool over the entire face had decreased from 49% to 43%. The remaining lambs, about 40% of the group, had partly covered faces.

★★★ BUY WAR BONDS ★★★
AND HOLD THEM

Increase of Malaria

In normal times there are more cases of malaria than of any other disease of man; war conditions generally increase greatly the incidence of this disease. In Macedonia there were only 90 cases of malaria among the British troops in 1915; by 1917 there were 70,000 cases, and 80% of the French troops in the area were incapacitated by the disease. In peace time the incidence of malaria among American troops in the Philippine Islands was only 25 per thousand. At the fall of Bataan it was 800 per thousand. Even before the war the world malaria total ran up to 800 million cases and three million deaths a year.

Many Species Susceptible to Distemper Virus

Distemper (Carré's disease) occurs naturally in the dog, fox, mink, ferret, weasel, civet cat, badger, raccoon and wolf. The virus is the same in all nine species, but it possesses the property, after a habitat of many generations in a given species, of developing an exalted virulence for that species and a decreased virulence for the other species which are susceptible to it. However, this is only 50% true of the ferret, which is highly susceptible to the virus from any source. This animal, like the other susceptible species, modifies the distemper virus if it is carried through many serial passages. The distemper virus then becomes mildly pathogenic for such species unrelated to the ferret as the dog and fox.

Credit the Habel Mouse Test

In 1937, 9,400 dogs were vaccinated against rabies, in Atlanta, Ga. The total dog population of that city was estimated at 33,000. Fifty-six "positive" heads were examined during the year in the health department laboratories. Three were from vaccinated dogs (1 in 3,133); 53 from unvaccinated dogs (1 in 408). In 1938 the "positive" heads from vaccinated dogs numbered 6; from unvaccinated dogs 48; in 1939 the numbers were 10 and 52 and in 1940, 14 and 2.

During 1941, the vaccinated dogs numbered 13,800, the unvaccinated were estimated at 19,200. The positive heads from vaccinated dogs was again two and from unvaccinated dogs 13. During this year the employment of the Habel mouse test for vaccine was commenced. The effect of eliminating substandard vaccine was shown in the head examinations in the two years that followed. In 1942 and 1943, approximately one-half the dogs were vaccinated. In 1942 there were 26 positive heads and in 1943 they numbered 45—all from unvaccinated dogs.

The *Wooster* [Ohio] *Daily Record* recently carried a story and a large illustration of a cow that had calved triplets, all of which were healthy and thrifty. This cow was inseminated artificially by Doctor Zuercher of Orrville, O., who gave the cow 20cc of gonadin three days before the insemination. All cows in this herd are inseminated artificially—one cow has been inseminated with unusual regularity—Feb. 9, 1941, Feb. 9, 1942, Feb. 8, 1943, and Feb. 5, 1944. All inseminations were with semen from the same bull and conception occurred in each case from a single treatment.

Importance of Necropsies

During the last six years the advances in bacterial chemotherapy have opened up immense possibilities and these, together with the work on hormone therapy and internal metabolism, provide an attractive field for research. These new subjects should, however, always be related to a full understanding of pathology without which, particularly when it comes to clinical application, such research may go astray; it remains as true as ever it was that morbid anatomy, both microscopic and macroscopic, is a fundamental discipline of medicine. . . . Men destined to become the outstanding clinicians of their day have always realized that their skill can be based only upon careful correlation of clinical symptoms with post-mortem findings.—Edt. in *Vet. Rec.* 56:5, p. 35, 1944.

Cheese-Borne Typhoid Outbreak

Seventy-six cases of typhoid fever occurring in California between April 9 and May 26, 1944, were traced to the consumption of contaminated cheese. The cheese was unpasteurized, unripened and of the Romano Dolce type. Within two months the state legislature passed and the governor signed a statute requiring that all cheese sold in California must be (1) pasteurized (2) made from pasteurized milk or (3) ripened for a period of not less than 60 days.

As the sanitary standards under which milk for consumption as fluid milk is produced and processed are improved, cheese which is commonly manufactured without even primitive sanitary safeguards, is rapidly coming to the front as a transmitter of typhoid fever. The new California law will no doubt largely prevent cheese-borne epidemics but esthetic standards of cleanliness in manufacture and merited popularity of this wholesome food will probably not be attained until sanitary supervision of the industry is removed from the state department of agriculture and lodged in the health department.

30TH CLASS OF THE ARMY SCHOOL OF MEAT AND DAIRY HYGIENE (CHICAGO)

Front Row, L. to R.—Lieuts. Edwin T. Padfield, Walter L. Mackey, Jr., Jerrold N. Henry, Majors Melvin E. Hodgson, Frank W. Jordan (Director), F. B. Thomson, Capt. Walbert O. Nelson, Lieuts. Hugh M. Phillips and G. H. Gitz.

Middle Row, L. to R.—Capts. W. C. Schofield (Instructor), Maurice H. Borer, Lieuts. Max M. Nickoles, Capt. Robert L. Mercer, Lieuts. Clarence H. Mannasmith, Wendell S. Wakefield, W. Douglas Nettles, Capt. Eugene E. Moon, Lieut. Borg D. Holen and Capt. W. O. Brinker.

Back Row, L. to R.—Lieuts. Leonard A. Bowstead, Robert B. Weber, Capt. Clarence H. Thompson, Jr., Lieuts. James R. Harris, David G. Sprinkle, Vernon S. Peterson, John Harrison, Leonard H. Melles, George F. Dixon and Capt. Howard C. Maxey.

Veterinary Service in Russia

Before the outbreak of the present war Soviet Russia had 8,200 veterinarians and 19,000 "feldschers"—assistant veterinarians—in the employ of the government. It had 23 veterinary colleges in which there were 12,500 students, of whom about 1,500 were graduated annually. There were, in addition, 83 training centers with 12,000 pupils which supplied 2,400 feldschers annually. The second five-year-plan called for the qualification of 5,000 veterinarians annually. Women were admitted to the veterinary colleges on an equal basis with men, and constituted 30% of the student body. In addition to the veterinarians and feldschers, the service also employed what is known as "veterinary sanitary workmen." Of these 65,000 were trained. The total cost of the veterinary service was 300 million roubles annually but was increasing as the service was extended. This did not include the cost of training veterinary specialists, veterinarians who were given post graduate work to qualify them for specialist positions. This extensive veterinary service has been maintained because healthy live stock is considered one of the fundamental issues in the National Economic Plan of the U. S. S. R.

In the first year of the war the 40 cavalry divisions of the Russian Army had a well organized veterinary service. Most of the treatments were carried out with the organizations in the field, but the graver cases were evacuated to veterinary hospitals in the rear. Especially constructed trucks, capable of transporting three animals, were used as veterinary ambulances.

Nine veterinary hospitals were located in the Moscow district. Some cared for infectious and others for surgical cases. The latter were equipped with electrically controlled operating tables and x-ray and radiant therapy apparatus, etc.

Complete equipment for three veterinary hospitals was supplied by funds raised by popular subscription in England and Scotland under the sponsorship of Her Majesty Queen Elizabeth.

Phenothiazine and Sheep Parasites*

The phenothiazine and salt mixture, 1:14, is an effective preventive of stomach worms and nodular worms in sheep. The 1:14 mixture is as effective as the 1:9 mixture recommended earlier. Phenothiazine given with the salt either in the 1:14 or 10% mixture has no effect on the parasites in the animal, but inhibits development of the eggs voided in the feces and thus prevents contamination of the pastures and massive infestation of the animals on it. It is purely a prophylactic measure and not a therapeutic agent. Heavily infested animals should be drenched with phenothiazine or given it in capsules in the usual therapeutic dose before being put on the mixture.

Sheep exposed to the usual feed lot and pasture infection, show a massive infestation of intestinal parasites of the ewes in April and of the lambs in July. In both instances the level of infestation falls markedly in a month, but not to a subclinical level, and then more slowly builds up again. If the ewes are treated in April and then the entire flock is put on the phenothiazine-salt mixture, 1:14, the infestation can be held at a subclinical level as long as the animals eat the salt mixture. However, the lambs should be watched for any evidence of parasitism and drenched with phenothiazine if it should develop.

Since even untreated sheep harbor but few stomach and intestinal worms during the cold months, it is not a bad practice to discontinue the phenothiazine from the middle of November until early April (several weeks before the sheep go on pasture) and immediately administer an anthelmintic dose and put them back on the phenothiazine and salt mixture. These dates apply to the latitude of Michigan. Further south they would be earlier. The worm infestation begins to build up, in the ewes, with the first warm days of early spring.

The animals should be allowed no salt except that in the phenothiazine-salt mixture. In cases where sheep have been fed salted hay, this mixture has failed to prevent infestation for the simple reason that the animals did not eat it, or enough of it. The phenothiazine-salt mixture must be kept dry and be readily and easily accessible to the ewes and lambs from early April until mid-November.

From the foregoing it is obvious that the phenothiazine-salt mixture will not protect sheep which are placed on pastures recently occupied by heavily infested sheep.

Neither the prophylactic nor the therapeutic use of phenothiazine is effective against the low level of nematode infestation of sheep that prevails in the winter time.

*Notes from an address by P. A. Hawkins at the 62nd Annual Meeting of the Michigan Veterinary Medical Association, East Lansing, June 27-28, 1944.

To summarize: The 1:14 phenothiazine-salt mixture is ineffective against sheep nematodes when, (1) they are heavily parasitized, (2) they are placed on heavily contaminated ground, (3) when any salt other than that in the mixture (as in salted hay or salt and mineral mixtures) is available and (4) the phenothiazine-salt mixture is not kept dry and easily accessible.

Properly used, however, the 1:14 phenothiazine-salt mixture is an exceedingly valuable aid to profitable sheep husbandry. It cannot be emphasized too strongly that if clinical symptoms of parasitism develop in a flock of lambs it will take far more time and feed to get them ready for market, even though they be treated successfully, than is the case with lambs not parasitized.

Protects Pigs from Parasites

In experiments conducted at the Beltsville Research Center of the U. S. Department of Agriculture, it was shown that liberal feedings of skim milk will rid young pigs of most of their internal parasites.

In a test lasting 57 days, litter mates were divided into two groups, one receiving a balanced ration and the other grain and skim milk. Both were severely exposed to parasites by being kept in an old hog lot known to be heavily seeded with parasite eggs.

When slaughtered at the end of the test, the group receiving milk as a part of the ration had gained an average of 50 pounds and were only moderately parasitized. The other group had gained an average of 40 pounds and were more than twice as heavily parasitized as the milk-fed group.

In a second test similar groups kept under similar conditions were fed 98 days, thus more nearly approaching farm feeding practices. In this test one group received a balanced ration without milk and the other a heavy feeding of milk for three days at two-week intervals. When killed at the end of the test the milk-fed pigs had gained from 83 to 115 pounds apiece and the other group an average of 32 pounds. Many of the group receiving a milk flush at two-week intervals were free from intestinal parasites and the remainder had only a few. The animals in the other group were heavily infested with intestinal helminths.

The conclusion reached was that under ordinary conditions pigs should, of course, be protected from intestinal parasites by good sanitation, but where this is not practical, and skim milk is available and not needed for human food, as it is at present, the feeding of it affords a means for the control of intestinal parasites.

Review of Important Higher Court Decisions Involving Veterinarians

By LEO T. PARKER
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EACH year the higher courts render decisions which, in one way or another, concern a majority of veterinarians engaged, as they are, in various pursuits. Many of these modern decisions reverse older law. In this article the most outstanding of such higher court decisions rendered in 1943 are reviewed for the purpose of assisting veterinarians to avoid law suits and also, to assist them, by reference to the cited modern decisions, in winning favorable verdicts in event of unavoidable suits.

Duty of Veterinarians

First, it is important to know that modern higher courts consistently hold that veterinarians must exercise ordinary care to determine whether animals have any infectious or contagious disease, or have been exposed recently thereto. Moreover, he must use ordinary care to diagnose the disease and treat the animal for this disease, or if the animal has more than one disease he must treat it for each of them. If the testimony is conflicting, a jury will be permitted to decide the case. Ordinary care as here used means the care and skill ordinarily possessed and observed by others in the same occupation in the same locality and under the identical circumstances.

For illustration, in Hohenstein v. Dodds, 10 N. W. (2d) 236, reported July, 1943, it was shown that suit was filed against a licensed veterinarian named Dodds to recover damages for his alleged negligence in the diagnosis and treatment of disease in pigs.

During the trial, the testimony proved that a farmer, who was raising a herd of purebred Spotted Poland China hogs, noticed that one pig had died and some of the rest of the herd were ill. He called Dodds, the veterinarian, to examine them. Dodds came to the farm and, after an examination, vaccinated the pigs for the prevention of hog cholera. Soon thereafter the pigs began to die rapidly and 63 of a herd of 86 succumbed and most of the remainder of the herd were diseased.

The farmer alleged that the pigs did not, in fact, have cholera and that the veterinarian was negligent in wrongly diagnosing and vaccinating for this disease.

The veterinarian defended the suit on the plea that the farmer had fed the pigs improperly and also that the pigs had necro enteritis at the time they were vaccinated.

Dodds produced as witnesses three experienced veterinarians who qualified as experts. Each of the witnesses was asked a question similar to the following: "Now, doctor, based upon your knowledge of veterinary medicine, and based upon the testimony as to the condition of the hogs . . . do you have an opinion as to what those hogs were suffering from at the time that Doctor Dodds was called to treat them?"

Each witness testified that he did have an opinion and that that opinion was that the pigs were suffering from hog cholera.

The farmer testified that Dodds did not examine the deceased pig but only "gave it a kick as he went by," that he spent less than a minute in examining the others and that he did not take the temperature of any of the pigs before making his diagnosis. On the contrary, Dodds testified that he thoroughly examined the dead pig, spent several minutes in examining the others, took the temperature of two, and that the temperature of one was 106° F. and the other "a little bit higher." The lower court held Dodds not liable in damages. However, the farmer appealed to the higher court which reversed the verdict and granted the farmer a new trial before a jury. This court said:

"Defendant (Dodds) contends that there was no evidence from which the jury could find negligence on his part. There was evidence of his admissions that the pigs had necro enteritis and opinion evidence that they had it. If so, and they were not treated for it even if they also had cholera, the case would be for the jury."

This court held further that if the jury should decide that the pigs had died as a result of improper treatment, or negligence, on the part of Dodds, the farmer was entitled to recover actual damages, saying:

"The proper measure of damages is the difference between the value of the pigs as they were on the date of defendant's (veterinarian's) call, if they were to receive proper treatment, and the value of those which survived defendant's treatment."

Obviously, in suits of this kind a jury listens to all testimony and renders its verdict in favor of the veterinarian if it is decided that he used the same degree of care as would have

been used by other reasonably competent veterinarians.

Life Expectancy of a Dog

Modern higher courts hold that parties to any and all contracts have a right to place such an interpretation upon its terms as they see fit. That, in all cases, where the terms of a contract, or the language used by the contracting parties, raises a question of doubtful construction, and the testimony shows that the contracting parties, themselves, have interpreted their contract practically, the courts will follow that practical construction.

For example, in Roy v. Salisbury, 121 Pac. (2d) 109, it was shown that a veterinarian sold a Doberman Pinscher pup. At this time the purchaser and the veterinarian agreed that if the purchaser "ever became unable to care for said dog" the veterinarian would house and care for the dog for the remainder of its life at the usual rate for housing, feeding and caring for such dogs, viz., at the rate of $20.00 per month.

Later the purchaser of the dog died and it was sent to the veterinarian who kept it for 24 months. The veterinarian sued the purchaser's estate to collect $480 for 24 months at the rate of $20 per month, and for an additional $20 per month during the life expectancy of the dog, or a total sum of $1,440.

In holding in favor of the veterinarian the higher court said:

"In this case the care of the dog was undertaken during the lifetime of Doctor Drucks (purchaser). At the time the dog was turned over to the plaintiff (veterinarian) no one was able to foresee when the doctor would recover or when he would die. . . . It is to be assumed that parties to a contract best know what was meant by its terms, and are the least liable to be mistaken as to its intention."

Duty of Land Owners

Frequently the opinions of veterinarians are sought by patrons on simple subjects of law pertaining to legal rights of animal owners. Modern higher courts hold that the owner of animals is bound at his peril to keep them off the lands of other persons. In other words, the law is established that while a land owner must do nothing which he *knows* will injure animals belonging to another, otherwise he is free to use his land as he so desires.

For example, in Louisville v. Gillespie, 172 S. W. (2d) 1015, reported April, 1943, it was shown that a land owner sprayed his grass with a poisonous chemical. Certain cattle became sick and others died by eating the grass. The owner of the cattle sued the land owner for damages. In holding him not liable, the higher court explained:

"He who suffers his cattle to go at large takes upon himself the risk incident to it."

Also, see Chemical Company v. Henry, 85 S. W. 401. In this case it was shown that cattle had entered a field and eaten some supposedly feed from sacks which actually contained poison (sodium nitrate fertilizer). The court refused to hold the owner of the feed liable and said:

The dog was sent to the veterinarian who kept it for 24 months

"The owners of lands are under no obligation to keep their premises safe for trespassing animals belonging to others."

Veterinarian Slaughters Cattle

Bovine brucellosis control laws or Acts, in various states, were enacted for the prevention, control and eradication of this disease among livestock. It gives to the State Veterinarian, and usually all other veterinarians within the state, certain legal authority and makes it a duty to use their best efforts to protect such animals from the disease. Usually the Act declares brucellosis to be both contagious and infectious and directs the State Board of Livestock Commissioners, or analogous authority, to take such measures as may seem necessary to them to eradicate and prevent the spread of that disease. It requires that the State Veterinarian, upon receipt of reliable information and whenever he knows, suspects, or has good reason to believe, that bovine brucellosis exists in any locality in the state, to go at once and make an examination of the cattle and, if infection be found, to adopt and enforce such quarantines and regulations as may be deemed necessary to prevent the spread of the disease. It provides a special test for the disease, the agglutination test, and for the condemnation, quarantine, and slaughter of cattle found infected.

In some cases these state laws provide that in the event the owner does not slaughter an animal found to be diseased within a specified

number of days after a specified test has been made, or within such period of time as the State Veterinarian may require, he is authorized to seize the condemned animal and slaughter it.

For instance, in Yoder v. Givens, State Veterinarian, 18 S. E. (2d) 380, it was disclosed that the operator of a dairy farm of 400 acres owned 150 cattle of which 100 were regularly milked, the others being dry cows, calves, heifers and bulls.

Testimony proved that the dairy farm is remote from all other cattle and stock; that the milk is pasteurized, then sold and delivered directly to the consumer; that the cattle had been vaccinated with an abortion vaccine

After the State Veterinarian made tests for brucellosis, he ordered the vaccinated cattle slaughtered

recognized as an effective preventive of brucellosis and approved, produced, and supplied under United States Government license.

The State Veterinarian, in accordance with the provisions of the Brucellosis Act, made a test of the various animals. He had not received any reliable information of brucellosis in the cattle and did not know or suspect the existence of that disease in or near the herd.

After making the test the veterinarian ordered the cattle slaughtered. The owner of the dairy farm filed suit and asked the court to grant an injunction to prevent the veterinarian slaughtering the cattle, on the ground that they were not diseased and reaction to the test was a result of recent vaccination with an approved vaccine. In refusing to hold in favor of the owner of the dairy farm, the higher court said:

"The statute charges designated officers with the duty of discovering brucellosis in cattle. Discovery is necessarily a prerequisite to its successful control and eradication. A delay in the examination until infection has permitted spread of the disease would largely nullify all efforts of prevention and control. . . . It is not for us to determine whether an agglutination test of a vaccinated animal, regardless of the prior health of the animals, is useful. The legislature has determined this in unequivocal terms. . . . Equity has not the power to enjoin or restrain a public officer from performing his official duties in a manner authorized by valid law nor to give relief against the enforcement of a valid statute merely because of an anticipation of damages in its administration."

Animal Owners' Liability

Few state laws specify when and under what circumstances the owners of vicious animals are liable in damages for injuries caused by such animals. Therefore, modern higher courts consistently hold that the owner of a domestic animal is liable for damage caused by the animal *only* if, to the knowledge of the owner, the animal has *previously* exhibited characteristics of an animal likely to cause such damage.

For example, in Hartman v. Aschaffenburg, 12 So. (2d) 282, reported April, 1943, it was shown that a fox terrier dog was known by its owner to be vicious toward other animals. One day he bit a pedestrian while attacking a dog held by the pedestrian.

Doctor Chapman, a veterinarian, was placed on the stand as a "character" witness for the dog. He said that though "this dog was a regular pet" so far as persons were concerned, "wirehaired fox terriers are of a snappy nature and will attack another dog on sight with slight provocation."

In holding the owner of the dog liable in $950 damages, the higher court said:

"The owner here has, we think, borne this burden to the extent that he has shown that if the dog had previously bitten any other person, he had no knowledge of such an occurrence, but he has failed to show that he did not know that his dog had formed the habit of attacking other dogs. In fact that record shows by an overwhelming preponderance that, though this dog had never been hostile to persons, it had always shown antagonism towards other dogs and it shows, too, that whenever another dog appeared, this dog was anxious to commence hostilities."

Also, see Perez-Sandi v. Berges, 12 La. App. 191, 125 So. 185, 187, where the court allowed recovery of $500 for dog bites. There a woman "was bitten 22 times and the essential medical treatment involved considerable pain and suffering."

In Montgomery v. Koester, 48 Am. Rep. 253, the Supreme Court allowed $500 for dog bites.

In McGuire v. Ringrose, 6 So. 896, the Supreme Court allowed $500.

In Anderson v. D'Inglanni, 134 So. 412, a man was awarded $1,500 for injuries resulting in serious infections caused by a dog bite.

The Chematherapy of 275 Cases of Anaplasmosis*

By H. C. SMITH** and D. E. HOWELL†
Stillwater, Oklahoma

ALTHOUGH Smith and Kilborne, during their famous investigation of the transmission of tick fever, saw the *Anaplasma marginal* and mentioned it in their classic report in 1893, the disease was not reported from Oklahoma until 1928. In the same year, it was reported also from California, Florida, Kansas, Louisiana, Missouri and Nevada. Stiles recently reported the occurrence of this disease in 23 states and in many foreign countries.

In this country, anaplasmosis, primarily a disease of cattle, is responsible for losses estimated at $100,000.00 annually. This is probably a gross understatement. It was reported from 48 farms in eastern Oklahoma in 1942. The loss on these farms aggregated 537 animals, valued at more than $50,000. Since many cattlemen fear quarantine measures, they often fail to report anaplasmosis cases. There is reason to believe that many outbreaks were not reported and that the loss in Oklahoma alone, in 1942, may have equaled the estimated loss for the whole country.

August 28, 1942, the owner of a large ranch called the Veterinary Department of the Oklahoma A. & M. College, stating that he had lost 18 cows and bulls in the past few days and that immediate assistance was desired. He was advised to bring in two sick animals for diagnosis. One of the cows died in transit and a necropsy was performed on arrival. Typical lesions of anaplasmosis were found. A microscopic examination of the blood, confirmed the diagnosis of anaplasmosis. The second cow was in a weakened condition when she arrived and was treated before unloading, and afterward was placed in an experimental barn for further observation. On a trip to the ranch three days later, additional autopsies on cattle were conducted, the results indicating anaplasmosis. At that time about 30 cows showed symptoms of probable anaplasmosis.

Since the ranch was remotely located, the services of a practicing veterinarian being unavailable, the Oklahoma Experiment Station officials authorized the veterinary and entomology departments of the College to investigate these losses and offer assistance in controlling the disease. The ranch owner cooperated fully in carrying on the treatment outlined in this report.

Location and Description of the Ranch

This ranch is located in the northeastern part of Oklahoma. It consists of approximately 37,000 acres of grazing land and 300 acres under cultivation. Some 150 artificial ponds supply water for the cattle; the majority of these having been constructed within the preceding two years. The ranch, irregular in outline, about 25 miles long and three miles wide, lies between the Big Caney and the Little Caney rivers. All of the land is accessible by car or on horseback. The pasture consists of native bluestem and Indian grasses, and also much lespedesa. Numerous trees provide ample shade. The entire ranch is fenced and cross-fenced with four strands of barbed wire, and is provided with swinging gates.

The herd contained 4,300 Hereford cows, 209 Hereford bulls, 25 mixed-bred, milk cows and an uncounted number of calves. The breeding record for 1942 showed about an 82% calf crop. Approximately one-half of the Hereford cows had been shipped from near Pampa, Texas, in October, 1940; the remainder of the cows had been bred and raised on the ranch. All the bulls were registered. They had been purchased in Missouri, Kansas, Texas and Oklahoma. The herd contained few dry cows at the time of the outbreak, since the majority of cows without calves at their sides, had been shipped to market. In addition to the foregoing, there were several Texas longhorn steers and Brahma cattle on the ranch. Goats, sheep, swine, mules, and horses also are raised.

Wild deer were so numerous that at times as many as 15 or 20 were seen grazing on the premises. A dozen bison were kept in a separate enclosure away from the cattle. Other wild animals seen on the ranch included coyotes, foxes, opossums, raccoons, skunks, wildcats, rabbits and squirrels. Quails and prairie chickens were abundant.

The ranch owner reported severe losses in his cattle from anaplasmosis during 1928, some in 1929, and two or three suspected cases each year thereafter. In 1941, about 15 cows died of what appeared to be anaplasmosis.

*This paper represents a cooperative project by the veterinary science and medical entomology departments of the Oklahoma Agricultural Experiment Stations.

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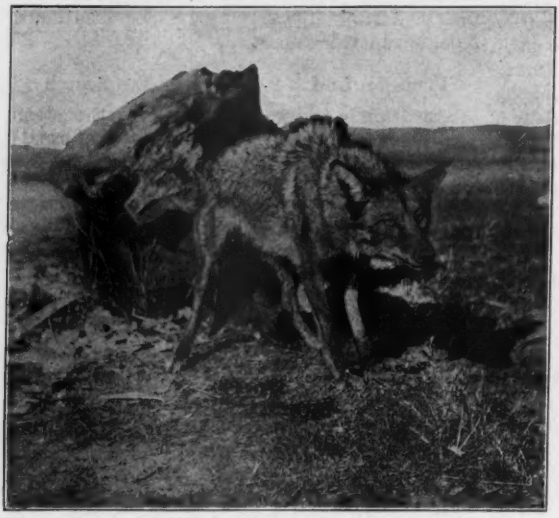
Reports of Medicinal Treatment of Anaplasmosis

The literature concerning the treatment of anaplasmosis is neither extensive nor conclusive. Favorable results reported by one investigator are often contradicted by others, and some reports have been based on a relatively small number of cases.



Coyotes, foxes, opossums, racoons, skunks and wildcats were plentiful on the ranch

In the United States, sodium cacodylate seems to be the most widely used drug for the treatment of anaplasmosis. Boynton[2] reported 33 recoveries in 39 cases from the use of 25 to 30 grains of sodium cacodylate per 100 pounds of body weight, given intravenously in a 5% dextrose solution. He later[3] found that 30 grains of the drug as a dose is more effective than 25 grains and suggested the use of 10% dextrose solution. Port[31] stated that large doses of cacodylate appear of value in the early treatment of the disease. Piercy[29] ranks sodium cacodylate as one of the most valuable drugs tried, for anaplasmosis. Following Boynton's dosage, Gish[13] obtained fairly good results from the large dosage. Farquharson[11] had inconsistent results, while Oglesby[24] reported that the mortality was not reduced in 50 animals treated with 450 grains of sodium cacodylate in 500 to 1000cc of 40% dextrose.

Trypaflavine has been widely used. Zwieten[47] using this drug in dilutions of 1 to 50, treated 104 cows and 20 water buffalo successfully. Stephan[38] reported that it impeded "the excessive multiplication of anaplasma bodies." Bakker[1] used trypaflavine with good results in the control of anaplasmosis in water buffalo. This was supplemented by regular dipping for the control of ticks. Farber[10] used two grains of trypaflavine in distilled water and reported that "in some cases the parasites disappeared from the blood after the first injection." There was also a reduction of temperature and a general physical response. On the other hand Picollo[30] used 16gm in five doses but noted no reduction in the number of parasites, nor improvement in condition, and Piercy[29] likewise obtained unsatisfactory results.

The use of mercurochrome has been suggested by several practitioners. In using a 2% aqueous solution, Parkin[26] stated that 0.4gm for calves and a maximum of 1.3gm for adult cattle reduced the temperature and resulted in complete recovery. The parasites were not affected, however, nor was the low number of red blood cells or volume altered. Dykstra,[9] *et al*, obtained prompt response and recovery following the use of this drug when used in a 2% aqueous solution. Piercy[29] showed favorable results with mercurochrome only when it was used early in the course of the disease.

The successful use of trypan blue is reported by Chamber[5] and Henderson[18]; however, only four animals were treated.

Neoarsphenamine was used successfully by Murray[23] and by Piercy,[29] although Farquharson[11] reported inconsistent results.

A recently introduced drug, aricyl, is reported on favorably by Piercy[29] and Ricks.[32] Merarsenide[32] has also shown promising results, as has Fowler's solution.[31]

Other compounds which have been used with negative or inconclusive results for the treatment of anaplasmosis are atabrin,[22] plasmochin,[22] quinine,[11] urotropin[11] piroblue and sodium cholate,[40] trypacrine,[29] ferric cacodylate,[11] trypan red,[2] and flavosol.[2]

Procedure

Experimental treatment was begun at once on the ranch. Possible insect vectors were observed (D. E. H.) in connection with the study of insect transmission of anaplasmosis.

The owner of the ranch provided a Ford

Photo by Stiles

We transported our paraphernalia in a pick-up truck

pick-up truck for transportation of the drugs and the equipment such as instruments, grips, ropes, water, soap, towels, etc.

Usually three cowboys on horses were assigned to catch cattle suspected of being

Photo by Stiles

Cowboys caught and cast the animals for us

sick. After roping a cow, we threw and immobilized her by tying two hind feet to one front foot. A physical examination was made, and the animal was observed for external parasites. If it appeared to have anaplasmosis, it was treated and an identification number was painted on the skin over the ribs with quick-drying white paint. Records for each animal were made of the number, date, pasture, physical condition, temperature, blood smear, hemoglobin, estimated weight, age, treatment, who gave the treatment, whether pox was present, and the point of origin. The age brands made it possible to determine the age accurately. Any unusual fact was recorded in the case record.

The bulls were usually excited and dangerous to handle. As a rule, they were found alone under a tree, or in some obscure place. In casting the bulls, one cowboy lassoed the horns, while a second roped a hind leg, each man pulling in an opposite direction, thus throwing and stretching the bull on the ground. Severe struggling often resulted.

Usually about 15 to 20 minutes were required to administer 1000cc of fluid by gravity and considerable maneuvering was necessary to prevent injury of the operator.

Because of the large number of cattle and the distances involved, it was impossible to visit each pasture every day; only about 1000 head could be examined daily. Sick cattle were treated during the week. On Saturday afternoon it was necessary to return to the college, to prepare drugs, sterilize instruments and complete other preparations for our work. The trip back to the ranch was made early Monday morning.

It was essential to obtain the full cooperation of the cowboys, who were of Indian descent. They possessed superstitious notions that airplanes flying overhead were dropping poison in the ponds, thus killing the cattle. Some accused neighoring ranchers of shipping in cattle from other areas and thus introducing the disease, although the imported cattle were healthy. The cow pox, that was prevalent in one pasture, was ascribed to chapped teats due to nursing large calves. High temperatures in the early stages of the disease were attributed to roping and rough handling. To disprove this latter belief, several normal cows were chased without causing appreciable rise of temperature. Much amusement was afforded when some one was thrown from a horse or was chased by a sick cow.

Symptoms

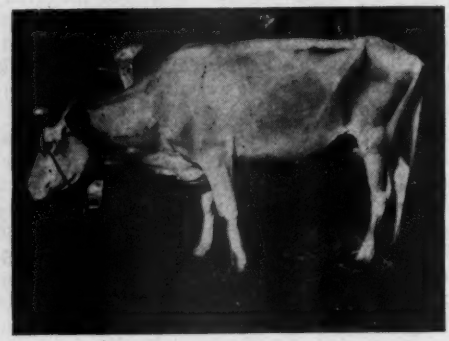
In the early stages of the disease, sick animals usually show high temperatures, often blood stained feces and a clear serous discharge from the eyes and nose. Drooping ears and hanging head are common. Marked dandruff is often present, especially around the

Photo by Stiles

head and neck. Hemorrhages may appear in the walls of the hoof of white footed animals. Diseased animals refuse to eat, they lie down frequently and walk with arched back and stiff wobbly gait. A "tucked-up" abdomen is common. Urination is frequent and dribbling. None of the 260 animals treated showed bloody urine.

During the later stages of anaplasmosis

there is a marked jugular pulse and an extreme icterus involving the muzzle, eyes, teats, udder and mucous membrane of the vagina. In the late stages, the hemoglobin may drop to 25% (Tallqvist), and affected animals often exhibit nervousness, shaking of the head, and



A typical case of anaplasmosis, showing emaciation and the stance characteristic of the disease

a wild facial expression. Prostration is common.

Methods of Treatment

Dextrose[8] is the primary substance of carbohydrate metabolism. It is the unit sugar into which all carbohydrate foods must be converted before utilization by the animal body. It is one of the few nutrients which may be utilized when introduced into the animal body *via* the blood stream. Some reactions may follow the administration due to the impurity of the water used in preparation of the solution. Should the water contain pyrogen, a nitrogenous product of bacteria, febrile reactions may occur following injection. Only double-distilled water should be used in preparation of dextrose solutions for intravenous injection, regardless of the concentration. All of the dextrose solutions used in our work were freshly prepared with triple distilled water. No buffer was used to control the pH of the product because the alkaline reserve of the body is sufficient to neutralize ordinary variations in pH should any occur. All aqueous solutions were 0.85% sodium chloride.

In the majority of the chemical preparations used, with the exception of formalin, the dextrose solution used was hypertonic. It is realized that perhaps this was not acceptable medical practice, because it is known that hypertonic solutions, in dehydration, only aggravate the condition and may produce shock and further dehydration due to diuresis. This method was used because the cardiovascular system would not permit infusion of large amounts of fluid in animals under restraint and the danger of applying larger volumes of fluid. The value of using isotonic solutions of dextrose is recognized in the treatment of various animal diseases.

Dextrose solutions[8] were used in the work, primarily, because they supplied a readily available source of food and served as an excellent means for the introduction of the different chemicals into the blood stream. In addition, the sodium chloride raises the low blood concentration and combats dehydration, helps prevent loss of weight and alleviates some of the symptoms such as indifference and sluggishness.

The jaundice[6] shown by most of the cattle is characterized by an excessive amount of bile pigment (bilirubin) in the blood. This excess stains the body tissues, mucous membranes and skin. Bilirubin[19] also prolongs the clotting time of the blood. This is counteracted by dextrose. The pigment is normally removed from the blood and excreted in the bile by the liver cells. If the liver cells are damaged, as they are in anaplasmosis, they are no longer able to remove bilirubin from the blood and it accumulates in the circulation. In jaundice dextrose causes the color of the bile to change from green to yellow and, finally, dextrose neutralizes many endogenous and exogenous toxins, in addition to stimulating replacement of damaged liver cells.

In some cattle suffering from anaplasmosis the kidneys may be affected and nitrogenous end-products may be retained in the blood stream instead of being excreted in the urine.

Dextrose Treatment

October 6th to 9th, 1500cc intravenous injections of 50% glucose alone was given to 14 animals, ranging in weight from 750 to 850 pounds; in condition from very poor to good; in temperature from 94.4° F. to 105.4° F. and in hemoglobin from 25 to 65%. All had positive blood smears. Of these nine (64%) lived. These included three of the five in good condition, all five of those in fair condition and one in very poor condition (hemoglobin 30%). Five died. These included two that were prostrate and probably moribund when treated (hem-

Prof. C. E. Sanborn, Oklahoma A. & M. College, one of the early investigators of anaplasmosis, died July 5, 1944. With Professor Herndon and Dr. Geo. W. Styles he spent 10 years in the study of this disease. Dr. A. T. Kinsley, the first to diagnose anaplasmosis in this country, died Feb. 26, 1942.

oglobin 25%), two in good condition and one in poor condition. All that died had cow pox, as a complication. All that lived, except two, had hemoglobin (Tallqvist's scale) ranging from 45 to 65%. During the same period eight untreated animals died.

Calcium Gluconate and Dextrose

October 25th, five animals were given intravenous injections of 1000cc of 50% dextrose solution to which was added 25gm of calcium gluconate. Calcium gluconate was used because it improves the function of impaired heart muscle, decreases the permeability of the capillaries, increases uterine contractions[37] and has a general stimulating effect when used in connection with dextrose. Veterinarians have found it helpful in debilitating disease. Some[32] have reported good results from its use in the treatment of anaplasmosis. To obtain definite information as to its use in such cases, this test of it was made.

The animals treated included a 1200-pound bull in good physical condition (temp. 103.4° F. hemoglobin 55%), two cows in fair condition and two in poor condition. The bull and two of the cows (hemoglobin 30% and 35%) lived and two (hemoglobin 25%) died.

The number of animals in this test was too small for the results to be significant.

Sodium Cacodylate and Dextrose

Sodium cacodylate[45] is used extensively in some forms of anemia, its action is thought to increase the number of red blood cells and, to some extent, the percentage of hemoglobin. Because of the nutritive support afforded by dextrose, we hoped that by combining it with the sodium cacodylate, recoveries would be more rapid than from the arsenic alone. The sodium cacodylate-dextrose mixture was combined in three different percentages (1) 33⅓% dextrose solution with 45 grains of sodium cacodylate, (2) 50% C.P. dextrose solution with 150 grains of sodium cacodylate and (3) 50% dextrose solution with 300 grains of sodium cacodylate. In all instances the medicament was administered intravenously. The first combination was tested on five cows, the second on four and the third on three cows as here indicated:

September 23-25, 1500cc of 33⅓% dextrose solution was given to five cows with weight range from 750 to 900 pounds, condition from bad to good, temperatures ranging from 100.2 to 105.4° F., age from 6 to 10 years, and hemoglobin from 30 to 65%. Three lived; one in good, one in fair and one in poor condition. The two that died were down and unable to rise when treated.

September 11-13, three cows in fair to good condition and a bull in poor condition were given 500cc of 50% dextrose solution to which was added 150 grains of sodium cacodylate. Their temperatures varied from 104.4 to 105.4° F. A hemoglobin test was made of only one cow. It was 40%. The cows were aged, the bull a four-year-old. All lived.

September 11th and 12th, 1000cc of 50% dextrose solution and 300 grains of sodium cacodylate was given to one cow in very bad condition (down, unable to rise and with a hemoglobin reading of only 20%) and two cows in fair condition. The first died, the latter lived.

During this period, Sept. 11-25, 25 untreated animals died.

Sodium Cacodylate Only

Sodium cacoylate UPS is converted to cacodylic oxide in the tissues and then to inorganic arsenic. Following injection, about one-third is excreted through the urine within 24 hours, the remainder remains in the tissues. Due to the slower release of arsenic from the cacodylate salt, it is less toxic than inorganic forms of arsenic. Since the reduction occurs slowly, the action of the drug is prolonged and the local irritant effects are lessened. This form of arsenic is one of the oldest preparations used by veterinarians in the treatment of anaplasmosis.

September 12th, 15th and 20th (in the test of this drug alone) we injected 45 grains intramuscularly and another 45 grains intravenously into 11 cows, eight in poor condition, three in good condition. No local or systemic reactions were noted in any of the animals so treated. Neither the temperatures nor the hemoglobin reading were determined. All lived. On the same days eight untreated animals died.

Aricyl and Dextrose

Aricyl[41] is a disodium salt of acetarsonic acid. It is an organic arsenic preparation of uniform composition marketed in a clear sterile solution to facilitate administration. It may be injected subcutaneously, intravenously, or intramuscularly in cases of debility, exhaustion, malnutrition, anemia, neurosis, and in conditions where a general tonic or stimulating effect is desired.

In some of our previous work[35] we have used this drug with apparently satisfactory results. Veterinarians[29, 32] in Texas and Oklahoma have been using this preparation this year in the treatment of anaplasmosis with gratifying results.

September 10, and 22 to 25, 1500cc of dextrose solution and 10cc of aricyl solution (0.5gm aricyl) were administered intravenously to 11 cows, varying in weight from 850 to 1000 pounds; in age from 7 to 10 years; in condition from poor to good, and in hem-

oglobin readings from 30 to 70%. Nine lived and two died, including one cow that was down and unable to rise when treated. In the same period 15 untreated animals died.

Aricyl

Aricyl alone was tested as a treatment by injecting 0.5gm (10cc of solution) intramuscularly and an equal amount intravenously.

This method of treatment was the most rapid and the number treated was larger than in any other way. When a prolonged effect of a drug is desired the intramuscular method is indicated. Therefore, one dose of 10cc was administered by this method and the same amount was given intravenously. With a preparation of this nature, a cowboy on horseback could carry this drug with him in the saddle pocket, and catch and inject sick cows much faster than by the other methods employed. The animals treated in the early stages of the disease recovered. Unfortunately no accurate records could be kept in these cases, except of the number of cows injected and the number that died. Temperatures, blood smears and hemoglobin readings were made on only a few of the treated animals. Altogether 83 animals were treated in this way; 65 recovered and 18, six being down when treated, died. Excluding these six of which there was probably little hope of recovery, 85% of the treated animals recovered.

Sodium Sulfathiazole (Sesquihydrate) Merck

The discovery of the sulfa drugs introduced a new type of chemotherapy in veterinary medicine. Several members in this group have proved highly effective in the treatment of a variety of conditions in cattle and other domestic animals including, poultry. Sodium sulfathiazole was selected for trial because of its low toxicity and high solubility and the fact that it could be injected intravenously with comparative safety.

One of the disadvantages of this drug is that it has a tendency to form calculi in the renal tract. There is some evidence[7] to show that when the urine is alkaline, as is normally the case in cattle, this may not occur. No hematuria appeared in any of the animals treated with this drug, which led us to assume that no significant kidney destruction occurred.

Greisheimer,[17] *et al* using rats, found that a single dose of sodium sulfathiazole had little effect on liver glycogen but raised the blood sugar, the increase being greater in those that had received dextrose. Sulfathiazole is less harmful to the liver and less prone to produce undesirable after effects than some of the other sulfa compounds.

In view of the impracticability of giving the drug by mouth to wild, range cattle, it was deemed advisable to give it intravenously in a single dose. A 5% solution of sodium sulfathiazole in 50% dextrose was used, the dose being 50cc per 100 pounds of body weight. Thus a 1000-pound animal received 25gm of sulfathiazole. This was given by the gravity method, which required about 20 minutes to complete. No cyanosis, dizziness, labored breathing, urticaria nor hematuria occurred as a result of this. The combination of the drugs used may have been responsible.

October 7-10, 12 cows were treated. Two were down and unable to rise when treated. Both died, as did one other in poor condition. The remaining nine recovered. They ranged in condition from poor to good and in hemoglobin from 30 to 60%. Of the cows that died, one, a downer, had a temperature of 96.8° F. and a hemoglobin reading of 25%. She died within an hour after being treated. The other downer had a temperature of 103.2° F. and hemoglobin 35%. The third animal that died had a temperature of 104.6° F. and a hemoglobin reading of 30%. All three that died had cow pox. The temperatures of the animals that lived ranged from 101.6° F. to 107° F.; four of them 106° F. or above.

Considering that two, of the three animals that died, were moribund and the third was suffering from pox as a complication, this test indicates a high percentage of recoveries for sulfathiazole. However, according to present understanding of the necessity for continued administration of this drug, a single dose of 25gm can scarcely be credited with having much effect on the course of the disease in the nine animals that lived.

Sodium Iodide and Dextrose

Sodium iodide is used intravenously in all species of domestic animals. Cattle are very susceptible to the action of iodine. It has some influence upon the secretory glands—increasing the quantity and changing the character of the secretion by diminishing excessive viscosity. Its influence on metabolism is exerted mainly through its action on the thyroid glands.

Johnston,[20] *et al* used sodium iodide in combination with other drugs successfully in the treatment of shipping fever in cattle. It is used, generally intravenously, in the treatment of actinomycosis. Farquharson[12] reports that the treatment causes no loss of flesh in beef animals and only a slight decrease in milk flow in lactating cows. Occasionally the drug causes abortion in pregnant animals.

The dosage decided upon for our test was 60gm (2 oz).

We hoped this heavy dosage might shorten the period of convalescence as well as des-

troy the parasites in the red blood cells. We hoped that combining it with dextrose would lessen the reaction, which sometimes occurs in cattle given sodium iodide alone. No systemic reactions occurred in any of the cattle treated with this combination.

September 11th and 12th, 11 cows were given 1000cc of 20% dextrose solution to which 60gm of sodium iodide was added. Of the 11 animals, six died and four which were in fair or good condition lived as did one cow which was in very poor condition. Four animals were down and unable to rise; two of them died before the intravenous injections were completed and the other two within a few hours. The remaining two that died were able to stand when treated but were in very poor condition. They lived for four days after receiving the injection. Considering the condition of this group the showing made by sodium iodide and dextrose was not bad.

Neosalvarsan (Winthrop) and Dextrose

Neosalvarsan, a brand of neoarsphenamine, is an organic arsenic compound containing about 19% of arsenic. It is a fine yellowish powder readily soluble in water at room temperature. The solution cannot be injected hypodermically because it irritates tissue and the drug precipitates out as the free base, the slow oxidation of which causes further local injury. When neosalvarsan is injected intravenously, it disappears from the circulating blood into the tissues where it is stored in the spleen, liver, skin and bones.

There are a number of diseases of animals such as dourine, shipping fever, infectious anemia, periodic ophthalmia in horses, leptospirosis in dogs and cats, and blackhead in turkeys in which neosalvarsan has been used to a considerable extent.

In animals,[42] success with arsenical drugs occurs when the injections are made during the early stages of the disease. In our work with neosalvarsan, we prepared a 25% dextrose solution in the laboratory, using triple distilled water. Sterilization was by the live steam method, for one-half hour on three consecutive days. The dextrose solution was taken into the pasture in an intravenous injection apparatus and the neosalvarsan was added to it just before administration.

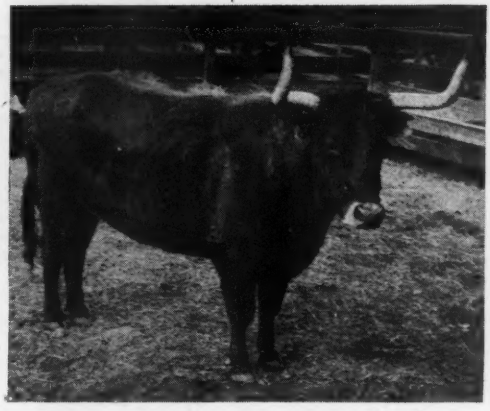
October 28-30, 24 cows were given 4.5gm neosalvarsan in 750cc of 25% dextrose solution, intravenously. The condition of these animals at the time of treatment was fair to good, with the exception of one cow that was down and unable to rise. Two, including the downer, gave hemoglobin readings of 25%. Three others gave 35% and the remainder 45 to 80% hemoglobin. All recovered. During the same period one untreated animal died.

Tryparsamide (Merck)

Tryparsamide[34] is a pentavalent arsenic compound. It has been used in the treatment of dourine in horses and blackhead in turkeys. It penetrates tissues more readily than most arsenicals, yet its toxicity is low. Owing to its rapid excretion there is no accumulation of the drug in the tissues.

Pearce[27] *et al.*, have shown that in trypanosome infection a single intravenous injection of tryparsamide causes the complete disappearance of the parasite from the human blood stream and if the injections are repeated the cure can be made complete and permanent. Other trypanosomiases[28] such as surra, dourine and nagana, fail to respond to this treatment.

The efficiency[43] of tryparsamide may be related to its ability to penetrate membranes



LONGHORN STEER
This animal belonged to the Will Rogers' herd of Longhorns at Claremore, Okla.

and because it is a pentavalent arsenic. One advantage the drug has over some of the other arsenicals in the treatment of anaplasmosis is that it can be prepared in advance for use in the field. Exposure and agitation of this solution does not increase the toxicity. The dextrose solution was prepared and the powdered tryparsamide was added. No reaction of the animals to the injection was noted.

This drug was tested on two groups of animals, one receiving 3gm doses, the other 5gm doses.

October 27 and 28, 1000cc of 25% dextrose solution to which had been added 5gm tryparsamide was given to each of 10 cows ranging in condition from very poor (hemoglobin 25%) to good. Five additional cows of the same average condition received 3gm tryparsamide in 1000cc of 25% dextrose solution. All lived. During the same period two untreated animals died.

Cobalt Chloride and Dextrose

Cobalt is one of the rare elements and little is known of its specific function in life processes, however, it is essential to the nutrition of animals. In the body it occurs in the highest concentration in the glandular organs, especially the pancreas, liver, spleen and kidneys. Cobalt is excreted in the urine, but the greater part of that ingested is not absorbed. According to Goodman,[14] *et al.* an interesting property of cobalt is the stimulation of the bone marrow which follows the intravenous injections of very small amounts. There is an increase of approximately 20% in both red blood cells and hemoglobin. Orten,[25] *et al.* have shown that the administration of small amounts of cobalt augment greatly the concentration of circulating blood cells with the result that the blood volume is likewise increased.

Kata,[21] *et al.*, believe that cobalt prevents the deposit of iron in the liver, spleen and bone marrow, but promotes its immediate ultilization for hemoglobin building. Polycythemia can be produced in anemic animals. It is possible that the primary effect of cobalt is to stimulate more rapid production of red cells, an effect which might be difficult to detect in some cows whose bone marrow had already been stimulated to increase red cell production as a result of the destruction of the cells caused by the *Anaplasma marginale*.

Range cattle can be handled only by men on horseback

The sulfur-containing amino acids, methionine, cystine and cysteine prevent the toxic effects that might be produced by the administration of cobalt when injected intravenously. The only untoward effect noted in our animals as a result of the injection, was labored breathing, which may have been due to the rapidity of administration. Animals would lie on the ground for 15 to 20 minutes after treatment. Attempts to get them on their feet during this time were unsuccessful. After resting for a while the animals would rise and walk away naturally.

Cattle suffering from cobalt deficiency show a rough hair coat, progressive debility, lack of appetite, emaciation and severe microcytic anemia. Cobalt given to such animals produces definite, prompt improvement.[25] Animals suffering from anaplasmosis show similar symptoms. On this account it was thought worth while to test the effect of the administration of this element in anaplasmosis.

September 23 and October 20, 21 and 30, fourteen cows in poor (one down) to good condition were given intravenous injections of 33⅓% dextrose solution to which 75mg of cobalt chloride was added for each 100cc of solution. The dose of the mixture administered was 1cc per pound, body weight. All of these cows lived except the one that was down and of which the hemoglobin reading was 25%. One with this low hemoglobin percentage, but able to stand, lived.

Cobalt Sulfate and Dextrose

October 23rd cobalt sulfate was tested in the same combination and dosage as the chloride in the preceding experiment. There were 19 animals in the group on which this medication was tried. They ranged in condition from poor (two down) to good. Thirteen of the animals, including one of those down, lived.

Formalin and Dextrose

Formalin[37] is an aqueous solution containing 37% by weight of formaldehyde gas. The intravenous injections of solution of formalin in normal saline of a strength of 1:5000 produce no ill effects in man.[15] Much stronger solutions have been used in horses and cattle without untoward effects. Injections are made slowly into the jugular vein.

Formalin is mainly oxidized to formic acid in the tissues, especially in the liver. A part of the formic acid may appear in the urine, although a part of it may be completely destroyed or transformed into methenamine. Formalin possesses valuable detoxicating properties, and is commonly used in the production of biological products to neutralize toxins, to kill aerobic and anaerobic bacteria and to render viruses innocuous. No trial of it in the treatment of anaplasmosis has been reported. We hoped to destroy the Anaplasma organisms in the blood of the animal by its use. If this could be done an effective, inexpensive weapon against the carrier stage of the disease would have been discovered. We first used a 2% solution of formalin in 1000cc of 50% dextrose solution, which means that each animal treated received 20cc of formalin. The injections caused distress, labored breathing, ex-

citement and uneasiness. None of the animals died but the reaction was so severe that we discontinued this procedure.

We next tried a 1% solution of formalin in 1000cc of 25% dextrose solution. While the reaction following this injection was not as severe as that manifested previously, it still was too severe for the veterinarian in practice to explain satisfactorily to an excited client. We finally found that 8cc of formalin in 500cc of 5% dextrose could be injected without any unfavorable reaction.

The fatal dose of formalin for mammals, intravenously, is about 0.07 to 0.09gm per kilogram of body weight.

This formalin treatment was tested on 45 animals which were more severely affected than the average. Ten of them were down and unable to rise and all died—nine of them within 12 hours and the other one 10 days later. Five of the 10 had subnormal temperatures, six had hemoglobin readings of only 25% when treated. Six more animals died and the remaining 29 lived. It seemed probable that the formalin injections were harmful and increased the mortality.

ALBINO BUCK
Deer were plentiful on the ranch, but albino deer are rare in any locality

Epizootiology

All evidence, available at the present time, indicates that anaplasmosis is spread by biting arthropods and insects, and mechanically, by dehorning, castrating, bleeding, vaccinating, etc. On this ranch there was no evidence of any mechanical transmission, so it is assumed that ticks, horseflies, mosquitoes, or other biting insects were responsible for the spread of anaplasmosis in the herd.

TABLE SHOWING COMPARATIVE RESULTS OF VARIOUS MEDICAMENTS USED IN THE TREATMENT OF ANAPLASMOSIS

Medicament	No.	Blood Smears P	N	NT	Prostrate	35% or less Hemo	Recovered No.	%
Dextrose Solution	14	14	0	0	2	7	9	64
Calcium Gluconate	5	4	1	0	2	4	3	60
Sodium Cacodylate	10	-	-	10	0		10	100
Cacodylate & Dextrose	12	10	2	0	2	3	9	75
Aricyl	83	-	-	83	6		65	78
Aricyl & Dextrose	11	9	0	2	1	4	9	82
Sodium Sulfathiazole	12	11	1	0	2	4	9	75
Sodium Iodide	11	5	-	6	4	5	5	45
Neosalversan	24	21	3	0	1	5	24	100
Trypersamide	15	12	3	0	0	6	15	93
Cobalt Chloride	14	11	3	0	1	4	13	93
Cobalt Sulfate	19	16	3	0	2	7	13	84
Formalin	45	35	4	6	10	12	30	67
Totals	275	147	23	124	33	60	204	74

During the spring, the American dog tick *Dermacentor variabilis* (Say) and the lone star tick *Amblyomma americanum* (Linn) were present in small numbers, but none were found during the outbreak. A single spinose ear tick *Ornithodoros megnini* (Duges) was found. Horseflies, particularly *Tabanus abactor* (Philip) and *T. atratus*, were numerous during August and the early part of September but were rare by October. Several species of mosquitoes were present but at no time in large numbers, during, or immediately before, the outbreak. Stable flies, *Stomoxys calcitrans* (Linn) and *Chrysops* spp., were common early in the outbreak but were seldom seen on the

cattle after October 1. Horn flies, *Lyperosia irritans* (Linn), were exceedingly abundant during August, September and October—even during November and December. Hundreds and, during warm days, thousands of horn flies were found on each animal. Sick animals had far more flies upon them than had normal animals.

It is probable that horse flies were the principal vectors during the summer months, but it hardly seems likely that they were important vectors during November and December as they were very rare by October 1, and the incubation period of anaplasmosis is seldom more than six weeks. Such evidence tends to incriminate the horn fly, but further research is needed to demonstrate its ability to transmit the disease, or to show that this insect is incapable of transmitting the anaplasma from infected to noninfected animals.

Conclusions

Treatment of cattle affected with anaplasmosis is a veterinary problem.

Good care is considered by many to be essential in the treatment of anaplasmosis. This is agreed to, but in outbreaks like the one experienced, no special care was practical because of the large number of sick animals.

Neosalvarsan, tryparsamide, cobalt chloride and sodium sulfathiazole, each in combination with large amounts of dextrose, gave the most promising results. Satisfactory results were obtained, also, by the use of sodium cacodylate alone, and in combination with dextrose, and by aricyl alone, and in combination with dextrose. Calcium gluconate, formalin, cobalt sulfate and sodium iodide in the combination with dextrose did not give desirable results.

As "conclusions," these are subject to a good many reservations. There was no accurate way of determining the relative severity of the disease in the groups on which the different treatments were tested. As shown, the number of "downers" and of cows with a hemoglobin reading of less than 30% was very unequally distributed among the groups. Of the 32 downers only two survived—a percentage too small to justify treatment.

Hemoglobin readings were not obtained for all the animals treated. Of those that were obtained, one cow had only 20% of the normal hemoglobin. As would be expected, she died. Sixteen animals had hemoglobin readings of 25% which must be considered extremely low, nevertheless seven of them lived. Of 17 animals having a known hemoglobin reading of 35%, 14 lived. This would seem to establish the critical point in hemoglobin loss in cattle.

Recovery of an animal from anaplasmosis following the administration of a drug is not considered a proof of the specificity of that drug. The benefit, if any, derived from the drugs used in this experiment may have been due to effects other than the destruction of the parasites. It was not possible with the manpower available to determine how many affected animals there were in the herd which were not treated; hence the percentage of spontaneous recoveries is unknown and cannot be compared with the percentage of recoveries among the animals that were treated.

Successful treatment depends upon recognition of the disease in the initial stage and early elimination of the anaplasma parasites from the blood cells, by some chemotherapeutic agent without damage to the blood-forming organs.

Recovery depends on the ability of the animals to regenerate red blood corpuscles and to overcome the intoxication.

Clinical cases of anaplasmosis may be confused with anthrax, idiopathic hemoglobinemia, hemorrhagic septicemia, piroplasmosis, leucemia and extreme parasitism.

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The Five Leading Dairy States

Wisconsin with 2,319,000 cows.
Minnesota with 1,715,000 cows.
Iowa with 1,446,000 cows.
Texas with 1,399,000 cows.
New York with 1,345,000 cows.

The total number of cows in the United States, exclusive of beef animals is estimated to be 25,159,000.

Inspection of Meat and Dairy Products

The Veterinary Corps is inspecting over one-half billion pounds of meat, meat-food, and dairy products each month in the United States for the Army and such of these items as are purchased by the Quartermaster Market Centers for the Navy, Marine Corps, and other government agencies.

The extent of milk inspection by the Veterinary Corps is indicated by the fact that the quantities procured for the Army in the United States are such that during the past year each soldier was provided with an average of one-half pint of fresh or reconstituted milk per day.—*Bul. U. S. Army Med. Dept.*

Grain Mixtures Unnecessary for Cattle

From experiments at three of its field stations, the Bureau of Dairy Industry concluded that when cows are given all the good legume hay they will eat, they will do as well on a single grain as on a mixture of grains and grain by-products. In the experiment, cows produced approximately as well on ground barley, ground yellow corn or ground kaffir corn as they did on a mixture of various grains and protein concentrates.

In experiments conducted at the Wisconsin and Ohio Experiment Stations the same conclusions were reached. The former compared corn and oats with a mixture of corn, oats, linseed meal and cottonseed meal. At the Ohio station two Holstein cows produced exceptionally well over a 13-month period on corn fed in combination with alfalfa hay.

Shikles Syringe with the Whitlock Nozzle for Administering Anthelmintics to Sheep*

By D. F. EVELETH** and J. O. FOSS**
Fargo, North Dakota

PHENOTHIAZINE mixed with salt has been found to be quite effective in controlling sheep parasites by Britton and his associates[1] as well as by Thorpe and Keith[2] and numerous other investigators. Britton[3] in an earlier review on phenothiazine literature lists *Trichostrongyles* spp. and *Nematodirus* spp. as two types of sheep parasites in which results with phenothiazine have been variable. These two types of parasites are common in the northwestern area of the United States. Preliminary studies under way at this laboratory indicated that continued feeding of phenothiazine in the feed would not completely eliminate *Trichostrongyles* spp. from the lambs suffering from heavy natural infestations. These results confirmed opinions given by various sheepmen that phenothiazine when fed in small doses would not control all parasites.

Administering an anthelmintic to a sheep

One of the main advantages of the salt-phenothiazine method of dosing sheep has been the saving in labor. The results obtained here have led to the recommendation of a combination feeding of phenothiazine mixed with salt and drenching with either therapeutic doses of phenothiazine suspension or with some other anthelmintic. An effort was made to find an easy and rapid method of drenching sheep with a minimum of danger to the animals.

It has been found that the Whitlock dosing nozzle fits the standard Shikles syringe and that most liquid anthelmintics pass through the apparatus with ease. The long nozzle introduces the dose far down the esophagus so that danger of the material entering the trachea is slight. The pump action of the syringe makes it possible to give any desired dose to each individual.

There are certain precautions which must be observed in the care of the Shikles syringe and the rubber bag and tubing. Copper sulfate does not harm the rubber but continued contact of the solution with the metal results in corrosion and eventually necessitates replacement of the parts. This can be prevented, to a certain extent, by washing the syringe with water whenever there is to be a period when the apparatus is not in use. Tetrachlorethylene is best mixed with mineral oil for administration unless capsules are used. The mineral oil and tetrachlorethylene mixture in a ratio of 1:1 is readily handled by the apparatus in 10cc doses for sheep. This mixture should be kept in contact with the rubber parts of the apparatus a minimum length of time as it tends to cause disintegration of the rubber. Some phenothiazine suspensions likewise contain ingredients which cause rubber disintegration which is noted principally on the balloon packings. However, they can be replaced readily when necessary.

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**Department of Veterinary Science, North Dakota Agricultural Experiment Station.

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The Status of Vinegar in the Control of Coccidiosis in Chickens

By ENA A. ALLEN*
Beltsville, Maryland

DURING the past decade poultrymen have frequently resorted to the use of vinegar as an agent for combatting coccidiosis, only to be disappointed with the results. Moreover, many proprietary products containing acetic acid or other acidulating substances have been sold to poultrymen for purposes of coccidiosis control. In large measure, this situation can be attributed to the encouragement offered by articles in poultry and farm journals wherein reference was made to a few promising results that were obtained in early preliminary studies with vinegar.

The scientific reports on the possible value of the vinegar treatment are very limited. This substance was among many that were tested by workers in this Bureau and the initial tests were somewhat promising. In the Annual Reports of the Chief of the Bureau of Animal Industry for the years 1933 and 1935, instances were cited in which an apparently beneficial action was achieved by providing birds with drinking water that contained a small amount of vinegar. At about the same time, L. M. Hurt stated in the 10th and 11th Annual Reports of the Los Angeles County Livestock Association that he had found the vinegar remedy to be of no value.

This paper embodies the results of all experiments conducted by the writer on the use of vinegar, including those of one experiment on acetic acid, as control measures for poultry coccidiosis as well as observations on the hydrogen-ion concentration of the intestinal tract of chicks as influenced by acidulated drinking water. The data are published in the hope that they will dispel the confusion that has arisen regarding the value of vinegar in the control of poultry coccidiosis.

Materials and Methods

The experimental birds were obtained as one-day-old chicks from the Animal Husbandry Division, Bureau of Animal Industry, Beltsville Research Center, Beltsville, Md. They were held in electrically-heated batteries until placed on experiment. Food and water were kept before the birds all the time, the same mash being fed throughout the entire experiment.

At the start of each experiment, the birds, with the exception of those of Experiment 4, were divided into three comparable groups. Group I of each experiment represented the inoculated-treated group; Group II received the inoculation but was not treated and Group III received neither the inoculation nor the treatment. In Experiment 4, the three above-mentioned groups were represented and, in addition, a fourth group which received a solution containing one part of a 5% solution of acetic acid and 79 parts water. Since vinegar usually contains ingredients other than pure acetic acid, some question arose as to the part they might play in controlling coccidiosis due to *Eimeria tenella*. Hence the reason for the inclusion of the fourth group of birds in Experiment 4.

The vinegar used was purchased at one of the local grocery stores; it contained from 4 to 5% acetic acid. A solution containing one part vinegar to 79 parts water was given to the birds of Group I in each of the experiments as a substitute for the regular drinking water. The concentration of acetic acid in such a solution does not exceed 0.06%.

In each of the first five experiments, the acidified water was administered to the birds designated to receive it at the time of the appearance of bloody droppings, while in Experiment 6 the regular drinking water was replaced with acidified water immediately after inoculation.

All coccidia used were obtained by sporulation, in 2.5% potassium dichromate solution, of oocysts removed with scrapings from the ceca and intestines of experimentally-inoculated birds which were killed on the seventh day after inoculation. As soon as sporulation was completed, the oocysts were freed from the detritus, by straining through a number of thicknesses of cheese cloth, and washed.

A mixed culture of coccidia, containing mostly *Eimeria tenella* and a few *E. maxima* and *E. mitis*, was used to inoculate the birds in Experiment I. Pure cultures of *E. tenella*

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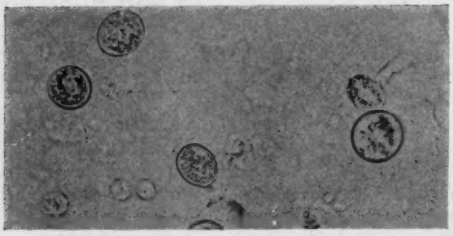
were used to inoculate the birds in the other experiments.

The number of sporulated oocysts per cc of inoculum was determined prior to inoculation by means of a Fuchs-Rosenthal counting chamber, 0.2mm deep. At least three different samples of the original culture were counted. These were averaged and a calculation was made of the number of oocysts present in 1gm of droppings. The number of sporulated oocysts fed to the birds of each experiment is shown in Table I.



Oocysts of *Eimeria tenella, x400.*—Photo by Benbrook

All chicks of the first four experiments were maintained in battery units throughout the trials, while those of experiments five and six were placed on the floor of a heated building. A litter of wood shavings was added at the beginning of the experiment and was not removed until the end of the experiment. Electric hovers were placed in the rooms for the comfort of the birds and were used when extra heat was required.

Chick ration No. 2, mixed by the granary supplying feed for the Government projects at Beltsville, was used in all the experiments. It consisted of 20.3 pounds of yellow corn meal, 10 pounds pulverized oats, 10 pounds middlings, 10 pounds wheat bran, 10 pounds meat scraps, 8 pounds alfalfa leaf meal, 22.9 pounds soybean meal, 1.05 pounds dried skim milk, 4 pounds riboflavin, 1 pound limestone, 0.75 pound bonemeal, 0.7 pound salt, 0.03 pound iodine salt, and 66 grams D-sterol, in every 100 pounds of the mixture.

Results

From the data presented in Table I, it is evident that vinegar and acetic acid are of little or no value for the control of poultry coccidiosis caused by *Eimeria tenella*. The differences in mortality of the treated and control groups were insignificant, with the possible exception of those in experiments one and three. Here the differences are great enough to suggest that some good may have resulted from the treatment. However, the number of birds used in these two experiments was small and the results obtained may have been due to chance rather than to the treatment. In experiments five and six, larger groups of birds were used in order to reduce as much as possible the element of chance. The small difference in mortality of the treated and control groups in each of these experiments furnished additional evidence of the ineffectiveness of the vinegar treatment in coccidiosis.

Battery units were used in the first four experiments

Table I—Results of Tests with Vinegar and Acetic Acid for Control of Coccidiosis

Exp. No.	Group	No. of Chickens	Age at Beginning of Experiment (Days)	Age at End of Experiment (Days)	Number of Oocysts Given	Average Gain in Weight (Grams)	Mortality (Per Cent)
I.	Treated	13	23	33	Not counted	18	36
	Controls (inoculated)	10	23	33	Not counted	57	60
	Controls (uninoculated)	19	23	33		81	None
II.	Treated	16	23	33	Not counted	74	56
	Controls (inoculated)	16	23	33	Not counted	120	50
	Controls (uninoculated)	10	23	33		128	None
III.	Treated	15	4	20	146,000	22	20
	Controls (inoculated)	12	4	20	146,000	64	50
	Controls (uninoculated)	19	4	20		78	None
IV.	Treated (vinegar)	19	4	18	8,500	30	26
	Treated (acetic acid)	15	4	18	8,500	46	13
	Controls (inoculated)	17	4	18	8,500	38	17
	Controls (uninoculated)	21	4	18		46	None
V.	Treated	59	10	21	7,500	39	62
	Controls (inoculated)	60	10	21	7,500	42	70
	Controls (uninoculated)	40	10	21		70	None
VI.	Treated	50	10	21	25,000	36	44
	Controls (inoculated)	50	10	21	25,000	34	38
	Controls (uninoculated)	41	10	21		43	None

As shown by Table I, the average gain in weight made by the treated groups was less than—sometimes only one-fourth of—the average weight gain made by the inoculated controls. This retarded growth in the treated groups cannot be explained at the present time, but there is a possibility that the vinegar water was toxic to the birds.

Discussion

For a number of years poultrymen were led to believe that the feeding of milk products were valuable in combatting poultry coccidi-

Chick suffering from coccidiosis

osis, the explanation being that these products rendered the intestinal contents acid and that coccidia could not flourish in an acid medium. However, recent investigations have shown that any therapeutic value derived from feeding milk preparations lies not in their ability to change the H-ion concentration of the intestinal tract but probably to their nutritional value.

Mayhew (1935) found that the ceca of chickens 10 to 12 weeks of age had a pH of about 6.6 and that those of older birds were approximately neutral.

It was pointed out by Mussehl, Blish and Ackerson (1933) that the fowl possesses, to an extraordinary degree, the power of maintaining a normal intestinal reaction on different diets. Therefore the effects of the usual routine treatments with buttermilk and other milk products upon intestinal acidity do not appear to have been investigated very thoroughly.

Kerr and Common (1935) tested the effects of hydrochloric acid and buttermilk on the hydrogen-ion concentration of the intestinal tract of the fowl and found that these agents did not change the acidity of the intestinal contents.

Likewise the feeding of vinegar water does not affect the H-ion content of the intestinal tract of the fowl. Tests conducted jointly by the Zoological Division and chemists of the Pathological Division of the Bureau of Animal Industry showed that the feeding of vinegar solution containing one part vinegar and 79 parts water, or a solution of pure vinegar did not lower the hydrogen-ion concentration of the ceca or that of other portions of the digestive tract.

Summary

Six experiments were conducted to test the value of vinegar solution for the control of cecal coccidiosis of young chickens. The data indicated that a vinegar solution containing one part vinegar to 79 parts water, used as a substitute for the regular drinking water, did not control cecal coccidiosis. Water to which acetic acid was added to make a comparable solution proved to be no more effective than the more dilute vinegar solution for the control of cecal coccidiosis.

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Ladina Clover Excellent for Chicks

Ladina clover as a pasture for poultry is growing in popularity as it is economical; some producers claim it saves 25% of the feed cost in rearing pullets. The plant has fine stems and luxurious leafy growth close to the ground and chicks like it.

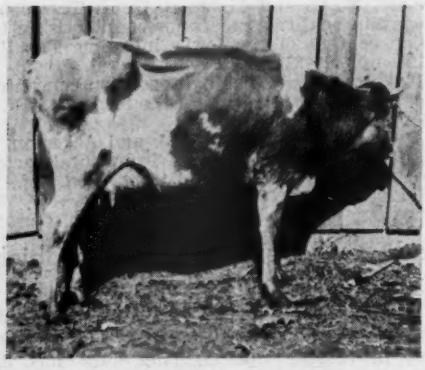
Reducing Sneezeweed Poisoning in Sheep

Sneezeweed poisoning in ewes is responsible for an estimated loss of $150,000.00 annually in the Rocky Mountain Forest Preserve, with much additional loss in Oregon, Idaho, Wyoming, New Mexico, Arizona, Utah, Nevada and California. A study of the manage of two 1000 ewe bands by the Rocky Mountain Forest Range Experiment Station demonstrated that 80% of the loss can be prevented by avoiding infested ranges in the spring and fall, light grazing for the remainder of the season, quiet herding and selection of bedgrounds free from the weed.

Clinical Reports

The First Reported Case of Acetonemia

In the caption of a halftone on page 276 of the July issue of VETERINARY MEDICINE the statement is made that acetonemia was first reported in this country by Dr. J. T. Alston in 1933. A statement having a similar import is made also in the April issue of VETERINARY MEDICINE (p. 150) and in all editions of "Udall's Practice of Veterinary Medicine." Not that the matter is important but just that the record may be straight it may be said that all the foregoing statements are inaccurate. The disease that has later come to be called acetonemia or ketosis was reported (*Vet. Med.* 26:6, p. 236) by me two years before the Alston report. At that time the ailment was new in this section and I called it "nutritive eclampsia," which in my opinion is a more appropriate name than the European name of acetonemia which has become generally current in this country. Acetonemia or ketosis indicates but a single symptom of the disease and not a particularly important symptom at that. Nutritive eclampsia tells the cause and indicates the more important symptoms.



Some cows with acetonemia exhibit impaired vision

I have seen more than a thousand cases of this ailment in the past 13 years, but I cannot improve upon the discussion of the cause, symptoms and treatment given in my first report. I do not accept Doctor Patton's new theory that the condition is a vitamin A deficiency. I have seen many cases in cows that had been on excellent pasture for 60 days or longer. In the beginning I regard it as a carbohydrate deficiency—the cow is not eating enough to maintain her production. In a few days after the onset of the disease, there may well be a vitamin A deficiency and a deficiency of all other vitamins and food factors as well. They are starved and dehyrated but they can't find food or water. I have seen them stand in creeks with their muzzles a few inches from the water and make a sucking sound. They were perishing of thirst and knew the water was there but didn't know enough to lower the head and get it. Seen in the pasture one would think they were grazing but closer inspection shows they are not touching the grass.

In the discussions referred to (Patton and Udall) it seems to me not enough stress is placed upon eclamptic symptoms. Practically all of these cases show nervous symptoms and some of them have convulsions. However, the most characteristic symptom is best described as "goofiness"—the animals just haven't sense enough to eat or drink or get about. Sometimes they will get started to eating grass and eat it right down to the roots and beyond eat a hole in the dirt several inches deep with good grass all around them. On running against a fence they are apt to stand and gnaw at it for hours.

In the treatment of these cases, the first requisite is a sedative and this may have to be continued for three or four days. Chloral hydrate is the sedative commonly used and is as satisfactory as any. However, bromides, chloroform, nembutal even atropine and magnesium sulfate solution are quite as effective.

I give an intravenous injection of calcium gluconate when the case is first seen. The sedatives are given for three or four days and good feed always including corn does the rest. All cases are normal in 48 to 72 hours and the milk flow is re-established in two to seven days, depending upon how early treatment is instituted. Nearly all these cases will live without treatment but they will go dry if not treated.

R. H. SMITH

Lewisburg, Tenn.

* * * *

Yeast for Overcoming Impaction

A horse was presented to the clinic for treatment for colic. It was given an aloetic capsule, a cajeput capsule and 10cc of pituitary extract, intravenously.

Five hours later, no relief having been obtained, an enema was given and a rectal examination made. An impaction in the pelvic flexure of the large colon was found. Massage would not move the mass. As the horse was getting weaker and suffering more, it was decided to inject, through left flank, a thick suspension of yeast. Four ounces was injected with a four-inch, 16-gauge needle. Five hours later, this large mass of fecal material broke up and relief was achieved immediately.

G. B. ADAMS

Vernon, Texas

Arsenic Poisoning in Cows

According to Milks, arsenic poisoning is one of the more common poisonings met with in veterinary practice. This type of accidental poisoning results mainly because of the frequent use of arsenic compounds as a weed killer, insecticide, parasiticide, rodent poison and, also, as a stable remedy. According to Law, the toxic dose of arsenic for cattle is three-and-one-half to seven drams.

Sunday evening, August 22, 1943, a call was made to a dairy to see three cows—two Holsteins and a Jersey. Some of the herd had broken through the fence and grazed for some time upon a railroad right-of-way that, a short time previously, had been sprayed to kill the weeds. The identification of the animals that were on the right-of-way was impossible, however, these three were off feed, depressed and the milk flow was decreased. A tentative diagnosis of poisoning was made. The formula of the spray compound was unknown. One pound of magnesium sulfate and six sodium nitrite tablets were given *per os* to each of the three ailing cows.

The next morning a return call was made. The three treated cows were worse—the Jersey cow being particularly bad. In addition, four more animals were affected and the symptoms were more pronounced at this time. All had a profuse watery diarrhea—defecation occurring every 15 to 20 minutes. There was anorexia, grinding of the teeth, depression and diminished milk flow. The Jersey cow was unable to stand. Information was received at this time that the weed-killer compound contained arsenic. A diagnosis of arsenical poisoning was made. Each of the affected animals was given one gallon of mineral oil, five sodium nitrite tablets, two ounces of sodium thiosulfate *per os* and 500cc of 20% dextrose solution together with 80cc of 20% sodium thiosulfate intravenously. In addition the Jersey cow was given a blood transfusion of 1000cc.

That afternoon three more cows sickened and were given *per os* two ounces of sodium thiosulfate and 80cc of a 20% thiosulfate solution intravenously. A few hours later the Jersey cow was given an additional 60cc of sodium thiosulfate, but she died that evening.

On necropsy a severe, hemorrhagic gastroenteritis, with cloudy swelling of the liver and kidneys, was found in the Jersey. This was further evidence of arsenic poisoning.

Return calls were made on the two succeeding days. Four animals still showed visible symptoms of poisoning and each day were given 60cc of a 20% solution of sodium thiosulfate intravenously. All were back to normal in two weeks without further treatment.

Altogether, 10 animals of the herd showed symptoms of acute arsenic poisoning and nine recovered. The high percentage of recoveries is attributed to the use of sodium thiosulfate.

CHARLES STUMPFF

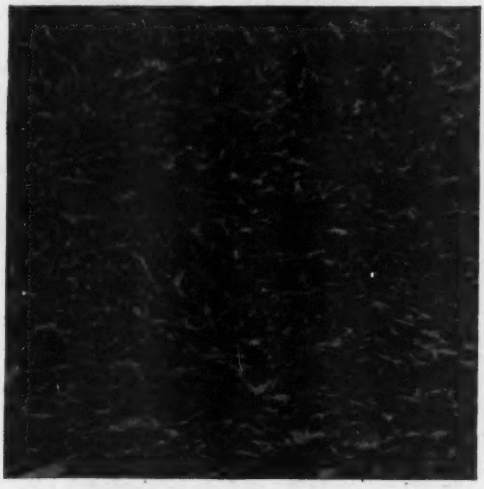
Nevada, Mo.

Neoplasms in a Dog

While the incidence of neoplasia in the dog is probably greater than in any other domestic animal the simultaneous occurrence of two of the more rare forms in the same animal warrants a report.

An eleven-year-old, male Scottish Terrier was brought to the veterinary clinic of the Kansas State College September 15, 1943, for the removal of a tumor on the right lower lip near the commissure. The growth had been noticed by the owner about six weeks previously. At that time the tumor was small. The neoplasm was now about two centimeters in diameter and was smooth, round and black.

Upon further examination it was found that



Fig, 1. Microscopic section of melanoma from the lip of a dog. The small black areas are melanin granules

the left testicle was greatly enlarged, while the right testicle was atrophied.

The neoplasm of the lip and the testicles were removed. The enlarged testicle weighed 112.8gm, the other 4.6gm. The dog made an uneventful recovery.

Microscopic examination revealed the lip tumor to be a malignant melanoma and that of the testicle an adenocarcinoma.

The histologic picture of the melanoblastoma included large polyhedral cells, many of which were undergoing mitosis and did not show melanin granules. The cells containing melanin were clumped into certain areas while

other areas were almost completely free of the pigment. Thus the histology of the neoplasm is that of a malignant melanoma.

Melanoblastomas are rarely found in dogs. Most of those that have been reported are malignant and a large proportion of them have occurred on the feet. Feldman reports that of 78 tumors of dogs in his collection only one is a melanoblastoma. Other writers report malignant melanomas of the tail, scrotum, brain and feet. I have not found a previous report of a malignant melanoma of the lip.

The microscopic appearance of the testicular neoplasm was that of a typical glandular carcinoma. The cells were of a large embryonic type with frequent mitotic figures. A great many of the cells showed definite fatty degeneration, characteristic of the degenerative changes that may take place in malignant neoplasms. The normal structure of the testicle was almost completely destroyed by the rampant growth of the neoplastic cells.

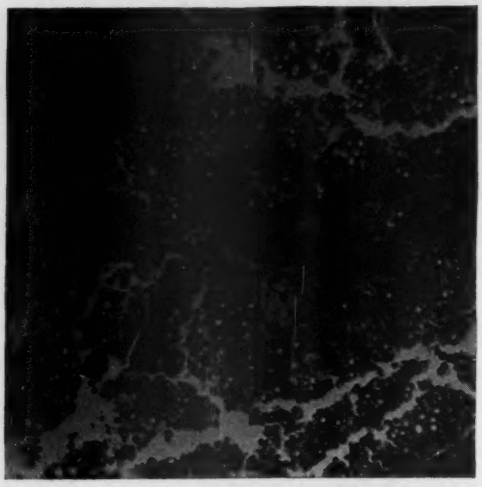


Fig. 2. Microscopic section of adenocarcinoma from the testicle of a dog. The light dots throughout the tissue are intracellular fat globules

While neoplasms of the testicle are more common in dogs than are melanotic tumors, the records show these to be one of the more rare forms. Sticker reports eighteen carcinomas of the testicle out of 766 cases of carcinoma of the dog. In Feldman's collection of 78 canine tumors only two were of the testicle. Murray's report on 49 cases of malignant tumors of the dog shows no carcinomas of the testicle.

However, the most interesting aspect of this case was the appearance of two malignant neoplasms in the same dog with apparently no relationship between the two. As the animal is still living it is not known whether there has been any internal metastasis from either neoplasm. At the clinic, however, the dog appeared to be in excellent condition—lively and alert.

About six weeks after the tumors were removed the animal was returned to the clinic with a melanotic tumor anterior to the location of the first and much smaller. It was removed and at the present writing (eight weeks after the second operation) the dog has not reappeared at the clinic.

Fig. 3. Gross sections through different parts of the adenocarcinoma in the left testicle of the case described. The illustration on the left shows complete obliteration and the one on the right only partial destruction of the testicular tissue

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Abnormal Sex Behavior in a Dog

In a previous report the writer[1] published a record of an observation of a case of sexual aberration in a dog very similar to the present report, but with some major variations. It is these variations in the two cases which prompt this report.

A male Chesapeake retriever, four years of age, normally developed in stature for its particular breed, possessed of a well developed musculature and skeletal frame, in a good state of nutrition, alert mentally, normally active and presenting no clinical symptoms of any obvious pathologic or metabolic disturbances, is the subject of this report. Normalcy of the psychological balance and effects of environment are of course excluded.

The unnatural conduct herein described was first noticed by the owner when the dog was three years of age and since then has been frequently observed. Just what the progenitor may have been in this case is also unknown. The owner did state, however, that he had noticed a definitely abrupt and radical change in the animal's attitude as pointed out in the following paragraph.

After one year of association with cattle, the dog was thought, by the owner, to be developing fear of them, manifested by almost constant "whining" while in their presence, decided "restlessness," increased excitability and a most apparent "unhappy" attitude towards his environment and "human associations." The dog stays with the cattle constantly while they are at pasture, but in no way functions as a herd dog. A period of only two hours' observation was sufficient to verify this clinical syndrome. Therefore, fear of cattle or other animals, even persons, it would appear, can definitely be ruled out as a phase of the symptom complex. This state of affairs was climaxed by the joint observation being reported.

In the similar case, reported previously, the dog, being of a small breed, was obliged to rest his front feet upon the hocks of the cow for support while he licked the vulva; this animal, being much larger, was not forced by circumstances to utilize such support to accomplish the same purpose but stood firmly and motionless upon his feet. However, acute engorgement and extension of the dog's penis did occur. This performance was known to occur only when the cattle were unable to escape, as when they were in stanchions. This action was not observed while the cattle were at pasture and the dog never demonstrated any such interest or intent under pasture conditions but appeared to desire the shelter and protection of the stable.

In view of the fact that the spread of bovine infectious abortion in a herd is still shrouded in some mystery, is it not rational to suppose that dogs possessed with such abnormal tendencies as herein described may be possible disseminators of infection from one herd to another or to individuals of the same herd and is it not possible for such dogs to be the disseminators of other genital diseases also? If such a dog had fed recently upon a newly aborted dead fetus or performed these abnormal acts upon an infected cow while she was in estrum or suffering a postpartum discharge, could it not be possible to infect other cattle as a mechanical carrier? While artificial infection of cattle with infectious abortion *via* the genital tract is considered questionable or unimportant, at least such infectious material could be deposited upon or about the external genitals of the cow, who in turn performs the perfectly normal and natural act of licking her own genitals for hygienic purposes, thus infection *via* the gastro-intestinal tract could very easily become a reality. It would also appear to be not at all impossible for such dogs to contaminate milking utensils by lapping up adherent milk and to deposit brucella organisms directly upon the skin and mucous membranes of the human subject while frolicking with the owner.

It is worthy of note that in the case here described and the one previously reported the herds concerned were known to be actually infected with brucellosis. Of course other infections such as infectious vaginitis, trichomoniasis, etc., might be transferred mechanically from animal to animal.

Dukes[2] quotes Schwarte who found by colorimetric methods the mean pH value of the dogs saliva to be 7.50. Kelser[3] states that *Alcaligines abortus* will develop on a media of a slightly alkaline reaction. In discussing resistance of the brucella organisms Gay,[4] *et al.* quote Kennedy who found that *Brucella melitensis* remained viable in sterile milk which had been inoculated with urine from goats suffering from the disease, provided the milk remained neutral to litmus and free of contamination. It therefore seems apparent that a great deal of confidence cannot be assumed for the bactericidal action of the saliva of the dog upon this particular species of organism.

While the epidemiology of infectious abortion is not the primary concern of this report, these remarks have been interpolated for the purpose of illustrating, secondarily, the possibility of these abnormal dogs becoming a factor in the spread of the disease in certain herds. In this particular case the latter point takes precedence since it becomes an economic rather than an esthetic problem, although the latter is the main concern of this report.

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3. Kelser, R. A. Manual of Veterinary Bacteriology, page 178, Williams & Wilkins Co. 1927.
4. Gay, Frederick P., et al. Agents of Disease and Host Resistance, page 713. Charles C. Thomas Co. 1935.

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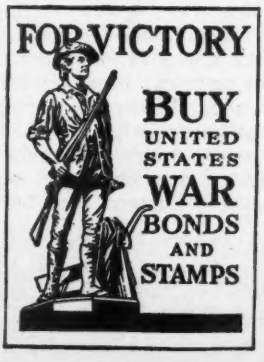

Abstracts

Eggs Contain Immune Bodies

It has been found by Hallaner[38] that hens immunized by vaccination against fowl plague (New Castle disease) produce eggs containing immune bodies. These bodies are present in the yolk only. Chickens hatched from such eggs are immune to infection from fowl plague for 26 to 30 days when they begin to lose the acquired resistance. Such immunity has not been observed after vaccination for fowl pox or laryngotracheitis.

Acetonemia and Vitamin A Therapy

Burt reports[40] the treatment of 18 cases of acetonemia in dairy cows (two Ayrshire, six Holstein and 10 Jersey) by giving them large doses of vitamin A. He describes two types of cases—digestive and nervous. The nervous type required larger doses of the vitamin than did the digestive type.

The response to vitamin A therapy was prompt and pronounced "even within 24 hours in some cases a surprising improvement was plainly visible." The conclusion of the author is, "Vitamin A treatment [for acetonemia] is much superior to other treatment and extremely easy to administer.

The Sire's Part in Breeding Failures

The interest in the fertility of farm animals is receiving ever increasing attention from livestock owners and this subject will demand the attention of veterinarians to a greater degree in the future than at present. It is the author's[41] experience that the sire is more often than is generally appreciated the cause of a low birth rate and unless the cause is obvious, the males as well as the females should always be included in the examination of a herd for infertility.

The main forms of sterility in bulls are, (1) absence of sexual desire, (2) inability to copulate and (3) inability to fertilize. The examination of the semen alone except in extreme cases is not sufficient to assess the breeding potentialities of the sire and may give an entirely false impression.

Lack of sexual desire is common in young males. Training may overcome the difficulty or stimulating treatment may be necessary. Pain in mounting, overexertion or a change in environment may cause frigidity.

Among the causes of inability to copulate when the desire is normal may be mentioned weakness due to overexertion or enervating feed; lack of exercise combined with food that is too rich or too bulky causing the bull to become too fat or pot-bellied which may cause misdirection of the penis; inflammatory changes in the skeleton, joints, muscles, feet, peritoneum or pericardum which may make mounting painful, and nervous disturbances which may result in imperfect erection or failure of the retractor penis to relax. Examination of semen from such bulls may indicate a high state of fertility and thus give the completely false impression that failure of the calf crop is the fault of the females.

In the third form of sterility in bulls—inability to fertilize—examination of the semen is of great diagnostic value. In such cases the male may copulate normally but conception fails and, unless the semen be examined routinely, great loss is likely to be encountered before the true cause of the low reproduction level is suspected. It should be emphasized that there are degrees of infertility ranging from satisfactory fertility to complete sterility. For fertilization to take place, a sufficient number of functionally normal spermatozoa must be ejaculated. This means that the total volume of the ejaculation and the density of the spermatozoa must be sufficient and the percentage of abnormal forms not too high.

The Literature of Veterinary Medicine

In a thoughtful article Harden[37] discusses the common waste of time and research funds on the investigation of problems that have already been solved or demonstrated to be impractical. I. F. Huddleston referred to the same when at the Washington meeting of the A. V. M. A., he said: "The newcomer, by his failure to become thoroughly acquainted with the past, often finds himself spending much time and energy in the study of a problem that needs no further elucidation." Miss Harden's strictures are aimed at research workers in medical science but unfortunately they apply in even greater degree to veterinary research. To quote:

"It has been definitely established that before any research project is begun, a thorough search of the literature should be made. This is both a time-saving and a dollar-saving procedure. If such a search is not made, time and money are wasted on a problem that may

[38] Hallaner, E., Zeitschrift fur Hygiene und Infekt. Krankheiten, 118, p. 605.

[40] Burt, A. C., Acetonemia: Observations of vitamin A. therapy. *Canadian J. Comp. Med. & Vet. Sci.* 8:7, pp. 187-188, 1944.

[41] Starke, N. C. Examination of the sire for fertility. *J. So. African Vet. Med. Assn.*, 14 pp., 142-147, 1943.

[37] Harden, Florence, The guides to the literature of veterinary medicine. *Bul. of the Med. Library Assn.*, 32:2, 1944.

have been previously solved or previously discarded because of lack of evidence to show its practical importance. On the other hand, a search of the literature may indicate the need for further research and so attest to the validity of the problem at hand."

"Unfortunately, in some medical research, the contributions of the world of animals have been seen too much in connection with the laboratory animals and not enough in connection with the field of veterinary medicine. Because of its status as a medical science and because its patients are of great economic importance and because of the availability of subjects for experimentation, veterinary research has yielded many discoveries that have been, and others that might well be, applied to human medicine. . . ."

After citing several instances in which important medical discoveries have been made in veterinary research and citing indexes and other sources where a record of research into animal disease problems may be found the author concludes:

"The literature of veterinary medicine is a vital part of the literature of human medicine. In it are recorded the beginnings of the study of such diseases as foot-and-mouth disease and brucellosis; the principles and progress of food inspection and its importance to public health. The world of animals cannot be divorced from the world of man so long as man lives on animal food, so long as man falls victim to diseases that also attack animals and so long as the past knowledge of medicine is a part of present practice. It is veterinary medical literature that points the way of the printed contributions of this field to medical progress."

Virus Influenza in Cats

Baker[36] describes a virus infection of cats characterized by sneezing, coughing and mucopurulent discharge from the eyes and nose. Although there are no symptoms of pneumonia, necropsies often reveal grayish, densely consolidated areas in the anterior lobes. The acute symptoms subside in about two weeks but the debilitating after effects persist for about a month. The disease is rarely fatal.

Mice, hamsters and young guinea pigs, are highly susceptible to the virus and practically all die of massive pneumonia in about three days, from intranasal instillation. When the virus was injected subcutaneously, intraperitoneally or intracerebrally no symptoms developed but the animals were rendered immune.

In rabbits as in cats the disease is debilitating but seldom fatal.

[36] Baker, J. A., *J. Exp. Med.*, 79 p. 159 (Feb.), 1944.

The author regards this virus as different from that of feline enteritis and as one not heretofore isolated or described.

Improved Vaccine Production

By means of a very powerful, newly-developed utraviolet lamp the authors[39] are able to inactivate bacteria and viruses, by an exposure of only a fraction of a second, without destroying the antigenic properties of the organisms. Vaccines made in this way were equal to or superior to those inactivated by chemicals or heat. Rabies and encephalitis vaccines inactivated by this method were much superior, in immunizing properties, to those inactivated by phenol and retained their antigenicity a great deal longer. Inactivations of bacteria and viruses by irradiation is not new, having been performed repeatedly during the past seven years with varying success. It is the newly developed lamp, which permits extremely accurate control of the radiation, that is responsible for the success of the method which was used by the authors.

★ ★ ★ BUY WAR BONDS ★ ★ ★
AND HOLD THEM

Improvement in Penicillin Administration

A startling new concept in penicillin therapy, making use of the secretory mechanism of the kidney, is reported by Beyer,[39] *et al*, medical research laboratories of Sharp & Dohme. It appears to be a solution to one of the most troublesome problems in the use of penicillin —its rapid excretion from the blood stream after administration and the consequent necessity that the drug be given to a patient almost continuously.

Penicillin and para-aminohippuric acid were administered to test animals in experimental investigations and it was found that the concentration of penicillin in the blood was maintained at a higher level and for a much longer period when the para-aminohippuric acid was administered. When penicillin was infused at the same rate to two groups of animals, the blood stream concentration of penicillin in those receiving para-aminohippuric acid was four to five times that of the animals not receiving it.

[39] Levinson, Sidney O., Milzer, Albert, Shaughnessy, H. J., Neal, J. L., and Oppenheimer, Franz. Production of potent inactivated vaccines with ultraviolet irradiation. *J. Am. Med. Assn.*, 125:8, pp. 531-532, 1944.

[39] Beyer, Karl, Woodward, R., Peters, L., Verwey, W. F., and Maltis, P. A., The prolongation of penicillin retention in the body by means of para-aminohippuric acid. *Sci.*, 100: 2588 (Aug. 8), 1944.

Book Reviews

The American Illustrated Medical Dictionary: A Complete Dictionary of the Terms used in Medicine, Surgery, Dentistry, Pharmacy, Chemistry, Nursing, Veterinary Science, Biology, Medical Biography, etc., with pronunciation, derivation and definition. By *W. A. Newman Dorland,* A.M., M.D., F.A.C.S., with the collaboration of *E. C. L. Miller,* M.D., Medical College of Virginia. Twentieth Edition, revised and enlarged. 885 illustrations including 240 portraits; 1668 pages. Published by W. B. Saunders Company, Philadelphia, 1944. Price, $7.50.

An appraisal of a work that has been a standard lexicon of the medical and veterinary professions for upwards of four decades and has attained 20 editions in 44 years is supererogatory. It remains only to say, as the publisher states that "this edition . . . represents a complete revision, involving additions and alterations on every page. It contains hundreds of new words not found in any other similar work." And further that from a mechanical and utilitarian viewpoint the work is more than satisfactory, the binding and indexing are superior, the arrangement of the vocabulary, orthoepic indication and definitions are excellent and the typography pleasing.

Minerals in Pastures: Deficiencies and Excesses in Relation to Animal Health. By *F. C. Russell,* B.Sc. Imperial Bureau of Animal Nutrition with a Foreword by *Sir John Boyd Orr,* D.S.O., M.C., M.D., F.R.S., 91 pages, paper. Published by the Imperial Bureau of Animal Nutrition, Rowett Institute, Aberdeen, Scotland, 1944. Price 5 shillings.

"Pasture is the natural food of cattle, sheep and horses. Even under intensive methods of production where fodder crops and concentrates are fed, these are, on the whole, merely supplementary to pasture either grazed or in the form of hay, grass silage or dried grass. Pasture is thus the main raw material of meat, milk, mutton, wool, hides and other products of herbivora. With the possible exception of cereals, it is the most important world crop."

With the foregoing opening statement in the foreword and the following observation the stage is set for a review of all the research into mineral deficiencies and the diseases caused by them, the world over:

"It has been found that mineral deficiencies are more important than vitamin deficiencies. If the pasture contains all the inorganic nutrients needed for health and is sufficient in quantity, there is unlikely to be a deficiency of either vitamins or proteins. The early work [nutrition research of the 1920's] emphasized the importance of the balance between soil and herbage and between herbage and the grazing animal. A soil deficient in inorganic constituents and water cannot sustain good pasture no matter what the quality of the species of pasture plant sown and, in the same way, a pasture deficient in quality or quantity cannot support healthy animals. Loss has been sustained in attempts to grade up animals by improving the breed without first grading up the pasture to a nutritive level which will support the improved breed. The soil, the pasture and the grazing animal have all got to be considered together."

Of the author's task in preparing the work Sir John Orr says: "Only those who have compiled and written such reviews appreciate the amount of laborious undertaking needed to bring together all the available information from the many hundreds of papers published and arrange it in a logical and lucid form."

The discussions include: cobalt deficiency (nine diseases in six countries), cobalt and copper deficiency (coast disease in Australia and salt sick in Florida), copper deficiency (seven diseases in five countries), sodium, potassium and chlorine deficiencies (widespread) iodine deficiency, phosphorus or calcium deficiency, magnesium deficiency (grass tetany), selenium excess, molybdenum excess, manganese excess, nitrate excess and fluorosis and arsenical poisoning.

Any book reviewed in these pages, or any other book if available, may be obtained by remitting the published price to VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago 49. Bulletins and Circulars should be requested direct from the address given in the notice. Generally they are supplied free unless a price is stated.

Useful Bulletins, Circulars, Etc.

Sheep Parasites.—Parasites and Parasitic Diseases of Sheep. Farmers Bulletin 1330 (slightly revised). U. S. Dept. of Agr., Washington, D. C.

Turkey Management.—A complete discussion of the breeding, incubation, feeding and marketing of turkeys (752 pages, illustrated) by *Stanley J. Marsden* and *J. Holmes Martin.* Interstate. Price $3.50.

Brucellosis Control.—The effect of *Brucella abortus* strain 19 on cattle of various ages and its bearing on adult cattle vaccination (reprint rept. 47th Ann. Meet. U.S.L.S.S.A.). Drs. Haring and Traum, Univ. of Calif., Berkeley.

Avian Anatomy.—An illustrated description of the skeleton articulations and muscles of the fowl (220 pages 10 x 13 inches, cloth bound, 95 plates) by F. W. Chamberlain. Memoir Bul. 5, Mich. Agr. Exp. Sta., East Lansing. Price $2.50.

Booklet on Beef.—Beef for the table, how to select it and how to use it. Cir. 585, Univ. of Ill. Agr. Exp. Sta., Urbana.